EXHIBIT 2

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Re: William Ankiel

You have asked me to prepare a report in the case of Mr. William Edward Ankiel. This letter provides that report.

I have been continuously licensed as a Professional Engineer for over 43 years. I retired as the Sector Vice President, Engineering for a major builder of United States naval warships. I am also a retired Captain, Engineering Duty, United States Naval Reserve.

I began my Navy career in 1968 immediately after receiving a Bachelor of Science degree from the U.S. Naval Academy with a major in Naval Science and a minor in Naval Architecture. This course of study included a number of courses in steam propulsion and naval ship machinery with two extended periods at sea where I obtained practical experience in the operation and maintenance of steam propulsion plants. I served eleven years of active duty in the Navy after graduation from the Naval Academy. During that time I concentrated on shipboard engineering and the repair and overhaul of Navy ships.

My first two tours of duty were at sea in the engineering departments of two steam powered Navy ships, USS BRUMBY (DE 1044) and USS NEWPORT NEWS (CA 148). During both of these tours I served as the Damage Control Officer. I completed an extensive qualification program for Engineering Officer of the Watch on NEWPORT NEWS and stood watches in that capacity for two years. NEWPORT NEWS utilized the same WW II era steam propulsion plant technology as USS HOLLISTER (DD 788) on which Mr. Ankiel served. I also qualified as a Surface Warfare Officer based on my experience on BRUMBY and NEWPORT NEWS.

From 1972 until 1975 I was a Navy sponsored graduate student at the Massachusetts Institute of Technology (MIT) in the Naval Ship Design and Construction curriculum. This three year program focused a number of courses upon steam propulsion and shipboard machinery and included courses in thermodynamics, fluid dynamics and heat transfer as well as boiler, turbine and pump design. I received both a Master of Science degree in Naval Architecture and Marine Engineering and the Professional Degree of Ocean Engineer from MIT.

Upon graduation from MIT, I was assigned to Charleston Naval Shipyard as a Navy Engineering Duty Officer. This tour included two years as a Ship Production Superintendent responsible for coordinating all repair work during overhauls of steam propulsion destroyers and nuclear submarines. I also served two years in the same shipyard as an overhaul program manager responsible for overhaul planning, financial management, work authorization and customer interface.

In 1979, when I completed my obligated service for my post graduate education at MIT, I resigned my active duty commission and entered both my civilian career and the Naval Reserve. My first civilian job was with the Charleston Office of M. Rosenblatt and Son, Inc., a marine engineering design firm. I served 18 months as Chief Naval Architect and 18 months as Technical Director of this office. During that time we designed ship alterations to modernize steam powered destroyers and tenders as well as diesel powered fleet minesweepers. As Technical Director I was also responsible for oversight of the preparation and review of Navy system technical manuals. This job included close interaction with Navy officials and employees during the review and approval process of technical manuals, drawings and other documents.

From August 1982 until January 2007 I worked as an engineering executive at Ingalls Shipbuilding. This company was owned by Litton Industries until 2001 when Litton was acquired by Northrop Grumman. I entered Ingalls as Chief Naval Architect responsible for the leadership of over 300 naval architects, structural engineers and designers. Three years later, I was promoted to Director, Design Engineering responsible for 1000 employees in all engineering disciplines involved in the design of new construction cruisers, destroyers, corvettes and amphibious assault ships. My responsibilities included supervision of the engineers that designed mechanical and piping systems and wrote and evaluated the technical specifications for machinery procurement and the group that worked with equipment manufacturers to prepare system and equipment technical manuals. In 1992 I was promoted to Vice President, Engineering responsible for a total of 2000 engineers, designers and logistics personnel. In addition to the design of new construction warships I became responsible for Research and Development and Fleet Modernization Design. I continued to have responsibility for the group that worked with manufacturers in the development of technical manuals. I held the position of Sector Vice President, Engineering for over 14 years until my retirement in January 2007. During my tenure as an engineering executive, Ingalls designed six major classes of naval warships and was responsible for modernization of three additional classes. This included the modernization of the Battleships USS IOWA and USS WISCONSIN which were powered by WWII era steam propulsion plants and the design of the WASP Class of Amphibious Assault Ships which is the last class of oil fired steam powered ships in the US Navy.

Concurrently with my civilian career, I completed 15 years of service in the Naval Reserve as an Engineering Duty Officer. This service included two days of active duty each month and two weeks of continuous service each year. This service was spent at Naval Shipyards, Supervisor of Shipbuilding Offices at private shipyards and the Naval Sea Systems Command working on naval ship engineering projects on a wide variety of Navy ship classes. I retired from the Naval Reserve as a Navy Captain (O6).

I am licensed as a Professional Engineer. I am a Life Fellow of the Society of Naval Architects and Marine Engineers (SNAME) and a winner of the SNAME William M. Kennedy Award for Shipbuilding Systems. I am also a Life Member of the American Society of Naval Engineers.

Attached is my current Curriculum Vitae for 2024.

Based upon my 26 years of experience as a commissioned Naval Officer and my many years of experience as a Naval Architect and Marine Engineer directing the design of United States naval warships as well as my extensive research of Navy specifications and standards, I can attest to maintenance practices and conditions aboard Navy ships. Based upon my four years of sea duty aboard U. S. Navy ships, during which I was an officer responsible for the leadership of Navy enlisted personnel in engineering ratings, I can attest to living conditions and practices aboard Navy ships. Based upon my four years of active duty at Charleston Naval Shipyard I can attest to overhaul and repair practices at shipyards.

I have reviewed Navy personnel records for Mr. Ankiel. Mr. Ankiel enlisted in the Navy on 26 April 1974. He completed basic training at the Great Lakes Naval Training Center on 3 July 1974 and was designated a Boiler Technician, Fireman Recruit (BTFR) on that date. Mr. Ankiel was promoted to Boiler Technician, Fireman Apprentice (BTFA) on 26 August 1974 after he completed the required time in service for promotion. Following leave, Mr. Ankiel attended and graduated from the Navy's "A" School for Boiler Technicians at Great Lakes Naval Training Center between 18 July and 29 August 1974. On 10 September 1974 he reported to the Navy's Shore Support Group at the Naval Station in San Diego, California. Mr. Ankiel was promoted to Boiler Technician, Fireman (BTFN) on 16 July 1975 at this command. On 31 October 1975, Mr. Ankiel reported aboard USS HOLLISTER (DD 788). On 22 March 1977 he was demoted to BTFA for "violation of a lawful general regulation". He was promoted again to BTFN on 16 September 1977. Mr. Ankiel received consistently high marks (3.6 to 3.8 out of a possible 4.0) for "professional performance" throughout his service aboard HOLLISTER. Mr. Ankiel was detached from HOLLISTER 16 April 1978 and was released from active duty with an honorable discharge on 21 April 1978.

I have read the transcripts of three "remote oral videoconference and videotaped" depositions taken from Mr. Terry Orton on 30 and 31 October and 11 November 2023. The pages in these transcripts were numbered consecutively and I will refer to these transcripts as the "Deposition of Mr. Orton" with the appropriate page numbers. Mr. Orton testified he served aboard USS HOLLISTER (DD 788) with Mr. Ankiel between June 1976 and about February 1978 in the forward fire (boiler) room. He recalled Mr. Ankiel was already onboard HOLLISTER when he reported aboard. Mr. Orton stated he considered Mr. Ankiel to be his "best friend" aboard HOLLISTER. Mr. Orton testified he was in a position where he could observe the work done by Mr. Ankiel and what he was working with and around. Mr. Orton repeated on numerous times during his deposition that Mr. Ankiel was very often his working partner for work done in the forward fire room aboard HOLLISTER. Mr. Orton served aboard HOLLISTER with Mr. Ankiel for about nineteen months. (Deposition of Mr. Orton, PP 18-23, 194-195, 475-476)

I have read the transcripts of two "remote oral videoconference and videotaped" depositions taken from Mr. Mark Edwards on 2 and 16 November 2023. The pages in these transcripts were numbered consecutively and I will refer to these transcripts as the "Deposition of Mr. Edwards" with the appropriate page numbers. Mr. Edwards testified he served in the forward fire room on HOLLISTER with both Mr. Ankiel and Mr. Orton and worked with them "on a daily basis". He noted Mr. Ankiel and Mr. Orton "were the main two guys that trained me when I went on board the ship. They were both there when I got there." Mr. Edwards recalled he reported aboard HOLLISTER in August 1976 and remained aboard until Hollister was decommissioned. (Deposition of Mr. Edwards, pp 16-18, 72-73, 84, 226-227) HOLLISTER was decommissioned in August 1979. Mr. Edwards served aboard HOLLISTER with Mr. Ankiel for about eighteen months.

USS HOLLISTER (DD 788) was built as a USS GEARING Class Destroyer at the Todd Shipyard in Seattle, Washington. Her keel was laid on 18 January 1945, she was launched on 9 October 1945 and she was commissioned on 29 March 1946. During Mr. Ankiel's service aboard, HOLLISTER was one of five Destroyers in Destroyer Squadron 27, home ported in Long Beach, California, whose mission was to serve as training ships for naval reservists. Each Destroyer had an active duty crew of about 212 officers, petty officers and and non-rated sailors and a reserve crew of about 124. A 2001 NAVSEA Ship Availability Database records HOLLISTER received a restricted availability at the Long Beach Naval Shipyard between 1 July and 1 August 1976 while Mr. Ankiel served aboard. HOLLISTER had been in continuous Navy service for about twenty nine years when Mr. Ankiel reported aboard.

Mr. Orton testified HOLLISTER mostly sailed off the coast of California while conducting reserve training and visited both San Diego and San Francisco. He stated HOLLISTER operated at sea usually three or four days a month plus a two week cruise once or twice a year. (Deposition of Mr. Orton, pp 294, 498) Mr. Edwards recalled HOLLISTER sometimes served as an airplane guard during flight operation of Navy Aircraft Carriers off the coast of California. (Deposition of Mr. Edwards, p 171)

As discussed above, Mr. Ankiel served in the forward fire room on HOLLISTER with Mr. Orton and Mr. Edwards. As a FA it is likely Mr. Ankiel first stood watches as the messenger of the watch. The messenger was responsible for checking the operation of machinery and recording data on this machinery, including temperatures and pressures. As a gained experience, Mr. Ankiel likely progressed from messenger of the watch to burner man, responsible for preparing the burner assemblies, lighting them and inserting these burners into the boiler and monitoring their operation. Mr. Orton had no knowledge that Mr. Ankiel stood any watches other than in one of the two fire rooms on HOLLISTER. (Deposition of Mr. Orton, p 376)

When not on watch, Fireman Apprentices and Firemen were assigned to assist Boilermen petty officers in the maintenance and repair of equipment such as valves, pumps, forced draft blowers, fuel oil heaters, boilers and other machinery. Machinery repairs included the removal and replacement of packing and gaskets in machinery as well as the removal and replacement of insulation on this machinery. Many of these repairs were completed in port, after the machinery had cooled down and after packing and gaskets had dried. Firemen and Fireman Apprentices were often required to clean machinery spaces both after maintenance activities and on a daily basis for general upkeep.

Mr. Edwards recalled he had to "clean and paint the bilges and that kind of stuff" when he first reported to the forward fire room on HOLLISTER and agreed he got the dirty work. He testified he also worked on equipment "all the time" when first assigned to the forward fire room "with the other guys instructing me". (Deposition of Mr. Edwards, pp 72-73)

Mr. Orton explained he prepared a list of the products with which he worked during his four years of service in the Navy. He testified this list was prepared between 17 and 23 September 2023. This list was read into Mr. Orton's deposition as Exhibit 1. This list includes Garlock, John Crane, Flexatallic and Lamon gaskets; John Crane, Garlock, Johns-Manville, Armstrong and Durametallic packing; Crane, Vogt, Fulton Sylphon, Chapman, Velan and Nordstrom valves; Northern, Buffalo, Gardner Denver and DeLaval pumps; Jerguson gauges; Copes-Vulcan soot-blowers; Westinghouse forced draft blowers; Foster Wheeler boilers; Armstrong and Velan steam traps; Fryer-Knowles contractor for decking removal and installation. (Deposition of Mr. Orton, pp 51-56)

Mr. Orton testified he and Mr. Ankiel and others "we worked on everything in that boiler room: valves, steam traps, the boilers, pumps, forced draft blowers, sootblowers, gauges, everything that was down there, piping". He noted valves were used to control the flow of fluids like water, steam or fuel and could be open, shit or partially open. Mr. Orton explained a valve bonnet is the top of a valve and contains the stem and hand-wheel. He stated the stem required packing to avoid excessive leaking. Mr. Orton responded "all the time" when asked if he and Mr. Ankiel removed gaskets from valves, including bonnet gaskets. He recalled he and Mr. Ankiel removed packing from valves more often than they removed gaskets. ". He noted "everything we did there seemed to be dust coming off" and explained he did not notice any difference among valve or pump manufacturers as it related to dust creation during gasket and packing removals. Mr. Orton testified "we" would remove valves from piping systems, "strip it down, clean it up" and repair valve seats using blueing compounds to check proper completion of work. He stated we would then reassemble valves with new gaskets and reinstall them in piping systems. Mr. Orton recalled this was part of the planned maintenance system and noted we did this work "ever so often". (Deposition of Mr. Orton, pp 23, 28-31)

Mr. Orton recalled Crane valves were installed on HOLLISTER because "Crane is here in Chicago". When asked if Vogt, Fulton Sylphon, Chapman, Velan and Nordstrom valves were also familiar to him, Mr. Orton replied "yes" to each of these. He recalled he worked on each brand about an equal amount of time. Mr. Orton testified he removed and replaced gaskets and packing on all of these brands of valves and remembered this work created dust. He stated he could see this dust on his hands and clothes and recalled he wore these clothes for the rest of the day after this work. (Deposition of Mr. Orton, pp 33, 57-60)

Mr. Orton testified he wore these dusty clothes back to the berthing area that was shared between Boiler Technicians and Machinist Mates. He recalled the Machinist Mates sharing this berthing space also came back to this space wearing dusty clothes from work in the engine rooms. When asked if he was able to say that all of the sailors in this berthing space contaminated one another. Mr. Orton replied "Yes. That's where we changed. That's where we lived, especially out at sea. That's where we hung out. Yes". (Deposition of Mr. Orton, pp 60-62)

Mr. Edwards testified the fire room and engine room crews on HOLLISTER shared a berthing compartment. He stated both crews wore their dirty and dusty clothing from work in their machinery spaces back to this shared berthing compartment. He replied "more likely than not, yes" when asked if he believed the fire room and engine room crews exposed each other to asbestos. (Deposition of Mr. Edwards, pp 57-58)

Mr. Orton testified he removed gaskets from pumps "all the time. Mr. Orton recalled he was familiar with Buffalo and Northern pumps without consulting his list and agreed he was also familiar with Gardner Denver and DeLaval pumps after he was specifically asked about these pumps. (Deposition of Mr. Orton, pp 28-31, 62-64)

Mr. Edwards testified he and Mr. Ankiel and other sailors in the forward fire room were exposed to dust from work on valves. He recalled they removed and replaced bonnet gaskets on valves and usually used bonnet gaskets supplied by the manufacturers of each valve. Mr. Edwards noted they would make bonnet gaskets in those cases where a premade bonnet gasket was not available. He testified he and Mr. Ankiel worked on Crane, Foster Engineering and Leslie valves and were exposed to dust from this work. Mr. Edwards explained the edges of preformed bonnet gaskets supplied by valve manufacturers were "cut much finer" than the edges of bonnet gaskets fabricated by sailors and stated he could tell when he was removing bonnet gaskets that had been supplied by valve manufacturers. He testified he and Mr. Ankiel removed bonnet gaskets supplied by manufacturers. (Deposition of Mr. Edwards, pp 40-43)

The removal of packing required machinists to pick the old packing out of packing glands with packing removal tools that resembled small cork screws. This old dried packing often came out in pieces and produced dust. Workers often blew the packing residue from packing glands either with their mouths or compressed air which produced dust which was often breathed. Machinery manufacturers often sold precut packing rings to the Navy and to shipyards for their products but new packing segments were also cut from rolls of packing with knives or shears. Each segment layer was placed in the packing gland with cuts staggered to reduce leakage. Examples of original equipment manufacturers selling replacement packing to the Navy will be provided later in this report. It is very likely Mr. Ankiel removed and replaced or observed others removing or replacing or cleaned up after the removal and replacement of packing on all of the machinery which required packing and on many of the valves in the forward fire room on HOLLISTER in which he worked for over twenty nine months.

Mr. Orton explained packing was a product that looked like a piece of rope that was placed in the top of a valve and "would be packed in there to prevent any steam from leaking". He recalled packing was used on "mostly valves" but "really anything that had a moving part". Mr. Orton stated he also worked with packing related to pumps and boilers. He remembered he had to remove packing "All the time. Almost every day." Mr. Orton described using "packing pullers" that "looked like a cork screw" for wine and other tools that looked like "oversized dentist tools" to remove packing. He stated the removed packing "was dried out, deteriorated, stringy, fibrous" and noted it came out "in little pieces" most times and only "very seldom" like it went in. Mr. Orton testified there'd be dust coming from it" (Deposition of Mr. Orton, pp 24-25, 29-30)

Mr. Orton recalled replacement packing usually came on spools in boxes or plastic wrapping. He stated these packaging materials were labeled with the manufacturers' names but noted the actual packing itself was not labeled. Mr. Orton agreed that he and Mr. Ankiel worked on the same equipment numerous times in a fire room on HOLLISTER and often removed and replaced packing and gaskets on the same machinery and valves. He emphasized "We worked on absolutely every component in our fire room" and agreed everything was worked on more than once while he served with Mr. Ankiel. Mr. Orton recalled Crane and Armstrong packing without consulting a list. When asked if he was familiar with John Crane packing he responded "when I say Crane I mean John Crane". He agreed Garlock, Armstrong, Johns-Manville and Durametallic were packing brands with which he was familiar. Mr. Orton testified he used all of these brands with the same frequency. He explained "they all created dust" when removed because they were old, dried out, burnt and rotten. (Deposition of Mr. Orton, pp 44-51)

Mr. Edwards explained packing "goes around the stems on a valve or it goes around the shaft on a pump" to prevent excessive leaking. He noted he had learned through reading over a period of years that packing usually contained asbestos and that asbestos was a fibrous, friable material used to resist heat. Mr. Edwards noted asbestos got in the air when asbestos machinery components were manipulated. He recalled he and Mr. Ankiel and Mr. Orton all removed packing with a tool resembling "a little pigtail where you kind of screw it in there and you pull it out". Mr. Edwards noted this often did not work well because the old packing was "so brittle and burnt". He stated this packing removal put dust into the air and agreed all three sailors were exposed to this dust. Mr. Edwards recalled the name Chesterton before he was shown a list of manufacturers and stated he recalled John Crane, Durametallic and Garlock after being shown a list. He testified he prepared this list, which became exhibit 1 to his deposition transcript, on 31 August 2023. Mr. Edwards agreed the names of packing manufacturers were usually on the spools and boxes in which packing was enclosed. (Deposition of Mr. Edwards, pp 19-24, 30-33)

Qualified Products List QPL-17303-8 dated 16 November 1966 contains listings for asbestos packing manufactured by Garlock, Johns-Manville, Dura Metallic, the Crane Packing Company (John Crane) and several other companies. Garlock styles 909, 8890, 5855 and 5901 are included on this list. Johns-Manville styles C-610, 610, MX4686 and 397 are included on this list. Dura Metallic style Duro-Plastic B-77 is included on this list.

As part of master discovery in case number 2004-03964 in the District Court of Harris County, Texas, 11th Judicial District, John Crane produced in response to interrogatory number 10 an asbestos packing style list headed *John Crane Houdaille General Asbestos Packing Style List* . The following John Crane styles were included on QPL-17303-8. The descriptions for these styles are taken from the John Crane asbestos packing style list:

a. John Crane Superseal No. 1: "plastic packing in bulk, spiral or coil form consisting of lead chips, asbestos fiber and synthetic binder."
b. John Crane style 250: "plastic consisting of asbestos fiber, graphite and binder core encased in a jacket of braided copper wire."

c. John Crane style 6AMCR: “Superseal (SS) #6 with monel wire inserted AAA asbestos jacket and a corrosion inhibiter.” Note SS#6 is “plastic packing in bulk, spiral or coil form consisting of asbestos fiber, graphite and synthetic binder.”
d. John Crane style 187I: “plastic core with zinc inhibitor added, over which is braided a jacket of Inconel wire inserted AAA asbestos yarn, graphite on outside”.

As discussed for specific machinery later, compressed asbestos sheet gaskets were used to seal many valve bonnets, pump casings and the interface flanges between heated piping systems and pumps, turbines and valves. These gaskets were also used to seal internal components in many items of machinery. The heat from steam and feed water caused these compressed asbestos sheet gaskets to adhere to sealing surfaces and required workers repairing machinery and valves to scrape the old gaskets off and to clean these sealing surfaces with hand and powered wire brushes. This work often produced dust which was breathed. Preformed replacement gaskets were normally used for complex gaskets such as those for pump casings and for gaskets which were difficult to form. These precut gaskets were often supplied to the Navy by the original equipment manufacturers who owned factory tooling to economically stamp out these complex gaskets. Examples of original equipment manufacturers selling replacement gaskets to the Navy will be provided later in this report. Navy ships, including HOLLISTER, also carried sheets of compressed gasket material which were used to replace flange gaskets or when preformed gaskets were not available. Sailors would normally place a sheet of this material over the surface to be sealed and use a ball peen hammer to tap out an outline impression of the new gasket. Usually the gasket would then be cut out using sheers, knives and punches. It is very likely Mr. Ankiel removed and replaced or observed others removing or replacing or cleaned up after the removal and replacement of gaskets on all of the machinery which required gaskets and many of the valves in the forward fire room in which he worked on HOLLISTER. He worked in this fire room for over twenty nine months.

Mr. Orton explained gaskets were placed between metal surfaces to seal the pieces together so that they became “airtight and steamtight”. When asked how often he and Mr. Ankiel worked on gaskets, Mr. Orton replied he had to remove packing “All the time. Almost every day.” He explained “we” would have to use scrapers and sometimes chisels to first remove old gasket material and “have to use both wire brushes and then bring it down to the bare metal with the emery cloth”. Mr. Orton noted “It had to be a nice, clean, clear surface” so the new gasket would not leak. He stated superheated steam leaks were very dangerous and ”could actually almost cut your arm off”. Mr. Orton explained “everything is super hot down there. And over time that heat just deteriorates and almost melts and bonds the materials to the metal. And it was just fried on there, stuck on there.” He testified removing gaskets “was just very tedious work” and “it took some time” and noted “there was dust in the air every time” he removed gaskets. Mr. Orton recalled manufacturers’ names were stamped across sheet gasket material, on the metallic parts of some gaskets, on premade gaskets and also placed on the packaging for these gaskets. (Deposition of Mr. Orton, pp 23-28)

Mr. Orton recalled using Garlock gasket material before consulting the list he had prepared prior to his deposition. He testified he made gaskets from sheets manufactured by Garlock. Mr. Orton also recalled making gaskets from sheets he believed were manufactured by John Crane and by Lamons. He

responded that he had also used Flexatallic, Armstrong and Lamons gaskets on HOLLISTER when specifically asked about each of these. Mr. Orton described using a ballpeen hammer "to make a little inscription" on sheet gasket material and mark "where all the nuts and bolts would go through" and then cut out the gasket with scissors and punch the bolt holes. Mr. Orton stated the ball peen hammer produced "very little" dust but noted dust was produced when the gasket material was cut with scissors. He testified he was familiar with spiral wound gaskets and described them as premade gaskets with metal on the outside and the gasket sealing material on the inside. Mr. Orton explained these gaskets were designed to fit specific valves, pumps and flanges and "were definitely labeled on the metal". He replied "yes" when asked if he worked with spiral wound gaskets manufactured by Flexatallic and also by Lamons. Mr. Orton testified he did not know while he was serving in the Navy that gaskets and gasket material contained asbestos but only learned later as a civilian boiler technician at the Great Lakes Naval Base. (Deposition of Mr. Orton, pp 33-40)

Mr. Edwards testified he worked with gaskets on valves, pumps, blowers, boilers and gauges. He stated he learned by reading through the years that both gaskets and packing "contained asbestos materials". Mr. Edwards said he had learned asbestos was a fibrous, friable material, resistant to heat, whose fibers got "in the air" when this material was manipulated. He explained old gaskets were "usually fried to the point where they were just brittle and dried out" and would put dust in the air when initially pulled apart and when scraped and wire brushed during removal. Mr. Edwards testified he, Mr. Ankiel and Mr. Orton all removed gaskets on HOLLISTER and believed all three breathed asbestos in the air. He recalled all three of them sometimes fabricated replacement gaskets from "big sheets of gasket material" and sometimes installed preformed gaskets. Mr. Edwards stated all three also worked with spiral wound gaskets. He remembered premade gaskets and gasket materials had manufacturers' names stamped on them. Mr. Edwards recalled the names Flexatallic, Garlock and Chesterton before he was shown a list of manufacturers and stated he recalled John Crane after being shown a list. He testified he prepared this list, which became exhibit 1 to his deposition transcript, on 31 August 2023. (Deposition of Mr. Edwards, pp 18-28)

Qualified Products List QPL 17472-30 dated 24 October 1972 records Garlock, Raybestos-Manhatten and a number of other companies manufactured compressed asbestos sheet gasket material qualified for Navy use.

A Department of the Navy Certificate of Approval (Serial No. EN28/L5/3917) documents that John Crane Compressed Asbestos Sheet was approved for U. S. Navy use based on Navy testing conducted on Raybestos Style B-73. John Crane Catalog 60, Copyright 1946 and John Crane Catalog 60-R-2, Copyright 1954 both by the Crane Packing Company advertise that "John Crane" Compressed Asbestos Sheet Packing, Style 2150 and 2151, conforms to U. S. Government Specifications. John Crane Catalogs 60-R-15 and 60R-9 advertise that John Crane Style 2150 meets MIL-A-17472, Class II and MIL-A-7021-A Class II specifications.

Mr. Edwards testified gaskets for high pressure steam had to be Flexatallic. He stated a scraper was used to remove any residue stuck to a mating surface from which a Flextallic gasket was removed. Mr.

Edwards explained he now knew Flexatallic gaskets contained asbestos but did not know this when he served aboard HOLLISTER. (Deposition of Mr. Edwards, pp 177-178)

Compressed asbestos sheet gaskets were widely utilized onboard Navy ships. Bureau of Ships standard plan B-153 specifies fluids and temperature and pressure ranges where this gasket material was utilized onboard Navy ships:

a. Saturated steam up to 300 psig (approx. 415 degrees F)
b. Hot fresh and salt water up to 400 psig and 180 degrees F
c. Sea water
d. Air up to 200 psig
e. Combustion gases up to 500 psig and 700 degrees F
f. Fuel oil including diesel up to 350 psig and 225 degrees F
g. Lubricating oil up to 200 psig and 220 degrees F

Bureau of Ships standard plan B-153 provided allowable packing and gasket choices for Navy valve, pump and other machinery manufacturers. These choices were based on the fluids being handled and the temperature and pressure ranges in which this machinery would operate. Once a manufacturer chose a specific type of asbestos-containing packing or gasket, that packing or gasket was normally utilized for the life of the machinery. Finding an acceptable non-asbestos substitute was very difficult and not normally attempted before the Navy and industry began to try to develop substitutes for asbestos packing and gaskets in the late 1970s and early 1980s. The following documents prepared by Navy machinery and packing suppliers illustrate this point:

a. A 1 November 1978 letter from the Crane Packing Company (John Crane) to the Crane Company states “Unfortunately there is no one material that completely takes the place of asbestos giving you the same chemical, pressure and temperature resistance that asbestos does”. This letter provides examples for both packing and gaskets. Later this letter states, “Because of the differences in material, tooling charges may be involved”. This indicates parallel asbestos and non-asbestos products of the same geometry were not being manufactured at that time.
b. A 9 March 1981 Crane Company memorandum addressing both packing and gaskets states “Few substitutes are available and these cannot withstand the range of temperatures, corrosion, strength and impact of asbestos materials. We may end up with a number of tailored substitutes to meet the range of application covered by asbestos alone. This could be a difficult inventory problem.”
c. A 21 November 1986 Buffalo Pumps Engineering Bulletin addressing flat gaskets and shaft packing states “Unfortunately none of the non-asbestos materials shown in tables I and II can be considered a universal substitute for asbestos either because of cost, temperature limit, or chemical compatibility.”
d. A letter written by General Electric on 13 February 1990 provides information concerning asbestos containing materials present in existing utility and industrial GE steam turbine generators. This document states “Flat sheet gaskets are used extensively for low pressure and low temperature sealing applications.” It continues “the industry has developed a variety of

non-asbestos replacements but none are exact substitutes. Typically the non-asbestos products cannot be directly substituted for the asbestos gaskets and long term specific application must be determined by laboratory tests and actual usage."

e. An Atwood and Morrill Technical Bulletin dated August 2010 states "Valves designed for asbestos packing rings required six or more rings to get effective sealing. Modern packing systems do not have the same compressibility that asbestos did and do not work as intended in these older valves. "

Fire rooms aboard HOLLISTER, as well as other Navy ships of this era, were densely packed with machinery and piping systems. Accessible systems and machinery expected to reach temperatures above 135 degrees Fahrenheit were insulated. Insulation protects sailors from burns, keeps spaces as cool as possible and ensures thermal efficiency of the steam propulsion plant and an acceptable lifespan of machinery in the steam propulsion plant. Steam condenses in non-insulated machinery and reduces the performance of this machinery to unacceptable levels. In addition, condensed water droplets erode turbine blading and other moving components and reduce machinery life.

Most of the insulation for hot machinery and piping systems on ships in the 1940s through October 1975 contained asbestos. These materials included asbestos felt and magnesia block and high temperature cement which both contained asbestos fibers. Insulation was covered with asbestos cloth lagging and painted. Removable insulating pads made from asbestos felt and cloth and packed with loose asbestos felt were wired to valves, valve flanges and the bolting flanges of machinery casings. The US Navy ceased installing asbestos insulation materials aboard new and existing ships in October 1975 but did not require the replacement of existing asbestos insulation unless it was required for the repair or overhaul of machinery and piping.

Mr. Orton testified most of the valves and other components in the fire room "had a blanket already preformed". He explained these blankets were attached with "wire wrapped around these little eyelets" and all he and others needed to do was remove the wire and set the blanket aside for reuse later. Mr. Orton recalled the permanent insulation was painted and labeled with the type of fluid and had arrows indicating the direction of flow. When asked if he was able to say if he and others were exposed to dust from insulation Mr. Orton responded "very little compared to the gaskets and the packing material". (Deposition of Mr. Orton, pp 56-57)

Mr. Edwards recalled "the only time we would mess with insulation was when we were painting it". (Deposition of Mr. Edwards, pp 69-70)

Fire rooms onboard older Navy ships in the 1970s were often dirty and dusty. Boilermen, Firemen and Firemen Apprentices were constantly taking machinery and piping systems apart and removing and replacing gaskets and packing to perform routine preventive maintenance and to repair broken equipment. This work often involved cutting, scraping and wire brushing of asbestos materials. These maintenance practices often produced airborne asbestos fibers. Cleanup of asbestos containing materials was often not controlled. Airborne dust, including asbestos fibers, created during many construction, repair and maintenance activities settled on horizontal surfaces in the densely packed

machinery spaces onboard Navy ships. Due to a lack of cleaning controls during maintenance, the inaccessibility between systems and machinery and time demands upon the sailors assigned to these spaces, much of this material was not removed. Machinery spaces were not air conditioned but cooled by large fans blowing ambient outside air into these spaces at high velocities. Protective equipment such as masks, respirators and special clothing were not required and were not normally utilized by sailors in the period of Mr. Ankiel's service.

When asked if he ever received any warnings from product manufacturers or contractors concerning asbestos or breathing dust. Mr. Orton responded "Never. Not once". He testified he and others did not know at the time of their Navy service that they were working with dangerous substances. Mr. Orton did not have any knowledge concerning what any companies may have told the Navy concerning asbestos. He stated the Navy did not warn him about any dangers associated with asbestos and declared he would have liked to have known and would have likely refused work around asbestos had he known. Mr. Orton testified no masks were available for asbestos work while he served in the Navy. (Deposition of Mr. Orton, pp 88-90, 126-133, 428-429)

Mr. Edwards replied "I didn't expect that, no" when asked if he had expected the work he did in a fire room aboard HOLLISTER with Mr. Ankiel and others was going to hurt him. He testified he never received any kind of information concerning potential dangers of asbestos and was never provided with any breathing protection while he served in the Navy. (Deposition of Mr. Edwards, p 59, 65-67)

Shipyard personnel were frequently onboard Navy ships during maintenance availabilities and overhauls to assist in repairing items that were beyond the capability of ship's force personnel. Sailors lived aboard their ships during most overhauls. Boilermen and Firemen training to become Boilermen on Destroyers were assigned to work in the fire rooms during overhauls and were often assigned to remove refractory from boilers and repair and overhaul valves during these overhauls. Boilermen and Firemen working in fire rooms during overhauls cleaned up daily after their own work as well as the work of shipyard personnel. As noted earlier HOLLISTER received a restricted availability at the Long Beach Naval Shipyard between 1 July and 1 August 1976 while Mr. Ankiel served aboard.

Mr. Orton testified an outside contractor used a large grinding machine to remove the non-skid decking material on the deck leading to and from the entrance to his work space in the forward fire room. Mr. Orton stated this work was done on at least one occasion but not on more than three occasions while he served aboard HOLLISTER. He recalled they were 'like, grinding it off" and stated this operation was "very dusty". Mr. Orton testified he and Mr. Ankiel were exposed to this dust because the deck being resurfaced was the only normal way out of his work space. He explained there was also dust created when this contractor mixed and applied the new decking material but stated it "was not a lot" but "the dust would be in the air". Mr. Orton responded "yes" when asked if he could say from his own experience that he and Mr. Ankiel walked through the dust from this work. He did not know the manufacturer of the replacement decking materials or the exact chemical composition of that material. Mr. Orton now believes this material contained asbestos. When asked if the name "Fryer-Knowles" was known to him, Mr. Orton replied he had "no doubt" that this was the company that performed this decking replacement. Mr. Orton recalled the hatch to the fire room had to remain open because this

hatch admitted fresh air to that space. Mr. Orton agreed with an attorney that Fryer-Knowles replaced square floor tiles in the heads on HOLLISTER at the same time as they replaced non-skid decking. (Deposition of Mr. Orton, pp 68-77, 197-231, 281-284)

Mr. Edwards recalled an occasion when "one of the sailors on the ship" replaced 12-by-12 floor tiles on HOLLISTER and stated "we were all exposed to it" when the tiles were installed "up and down the passageway". He testified he did not do this work and did not observe Mr. Ankiel doing this work. Mr. Edwards did not know the manufacturer of these floor tiles or their chemical composition. Mr. Edwards recalled non-skid decking removal and replacement being done during a shipyard period on HOLLISTER. He did not recall the company that did this work or the companies who manufactured replacement decking materials or any of the ingredients in this non-skid material. Mr. Edwards did not know if the floor tiles and non-skid decking materials installed on HOLLISTER contained asbestos or not. (Deposition of Mr. Edwards, pp 93-100)

HOLLISTER was built with two engine rooms and two fire rooms. With a few exceptions, which will be detailed in this section of this report, the same machinery was installed in each engine room and the same machinery was installed in each boiler (fire) room. Both USS SUMNER (DD 692) and USS GEARING (DD 710) Class Destroyers were designed with the same machinery and machinery drawings for both classes were termed DD 692 Class drawings. A number of manufacturers provided machinery and equipment installed on HOLLISTER. Much of this machinery and equipment is recorded in the following documents:

a. Supervisor of Shipbuilding, USN, New York, New York letter dated 13 October 1943 (SUPSHIP New York letter dated 13 October 1943)
b. INSURV reports for inspections conducted onboard HOLLISTER on 10 June 1953 and on 13 January 1960 (1953 and 1960 INSURV reports)
c. Manufacturers drawings and instruction books

Mr. Orton testified he and Mr. Ankiel worked together in the forward fire room aboard HOLLISTER but sometimes also worked in the after fire room. (Deposition of Mr. Orton, pp 117, 138-139, 272-281)

Four Foster Wheeler boilers were installed on HOLLISTER, two in each fire room. This is recorded in the 1953 and 1960 INSURV reports and in a Foster Wheeler instruction book for Foster Wheeler boilers installed on DD 692 Class Destroyers. Both Babcock and Wilcox and Foster Wheeler manufactured boilers for DD 692 Class Destroyers to the same design. This design was prepared by Babcock and Wilcox but Foster Wheeler prepared drawings, material lists and an instruction book to document the boilers that were manufactured by Foster Wheeler. Mr. Orton testified Foster Wheeler manufactured the boilers installed on HOLLISTER. (Deposition of Mr. Orton, p 77)

Foster Wheeler *Bills of Material and Production Lists* for DD 692 Class Destroyers provide information on the materials contained in these boilers:

a. 4 per boiler compressed asbestos sheet gaskets for economizer doors
b. 170' per boiler woven asbestos tape, 33P2 (1/8" x 1 ¼")

c. 200 sq ft per boiler asbestos millboard, 32M1, grade A (1/4"thick)
d. 38'6" per boiler brass sheathed asbestos insert packing strip (1/16" x 1 ½")
e. 2 per boiler compressed asbestos sheet economizer inlet manifold seals
f. 2 per boiler compressed asbestos sheet economizer outlet manifold seals
g. 71'4' per boiler of ½ " diameter asbestos rope, 33P5
h. Four per ship ½" globe valves with asbestos stem packing, Symbol 1108
i. Four per ship ¾" angle valves with asbestos stem packing, Symbol 1108
j. 16 per ship: installed flexible steel & asbestos hand hole gaskets, 33G11, class A (size#24: oval 5 ¼" x 4- 9/16")
k. 92 per ship: installed flexible steel & asbestos hand hole gaskets, 33G11, class A (size#40: oval 3 ¾" x 3 -3/8")
l. 32 per ship: spares flexible steel & asbestos hand hole gaskets, 33G11, class A (size#24: oval 5 ¼" x 4- 9/16")
m. 184 per ship: spares flexible steel & asbestos hand hole gaskets, 33G11, class A (size#40: oval 3 ¾" x 3 -3/8")

The Foster Wheeler instruction Book records the following companies provided equipment to Foster Wheeler for the boilers on HOLLISTER:

a. Manning, Maxwell & Moore Consolidated Safety Valve Division – Valves and Fittings
b. Crane Company - Valves
c. Bailey Meter Company – Feedwater Regulators
d. Crosby Steam Gage & Valve Company – Steam Gages
e. Yarnall-Waring Company – Remote Water Level and Pressure Differential Indicators
f. Vulcan Soot Blower corporation – Soot Blowers
g. Todd Combustion Equipment Inc. – Oil Burners
h. Robert H. Wager – Smoke Indicators

Mr. Edwards recalled Yarway (Yarnall-Waring) made sight glasses associated with the boilers. He also recalled burners on the boiler were replaced "one time". (Deposition of Mr. Edwards, p 85, 264-267)

Mr. Orton recalled there was packing associated with these Foster Wheeler boilers on HOLLISTER and noted "every valve, every gauge that was attached to that boiler had to be able to be removed for repair, for maintenance" (Deposition of Mr. Orton, pp 78-79) Mr. Edwards testified "the packing on the valves that were attached to the boiler" contained asbestos. He recalled seeing Garlock, Chesterson and Foster Wheeler markings on the boxes in which packing came to the fire room. Mr. Edwards said these boxes "never had any warnings at all". (Deposition of Mr. Edwards, pp 256-264)

Furnaces of these boilers contained insulating blocks with asbestos content. These insulating blocks were the first layer of material placed on the steel boiler casings and were covered with several layers of firebrick and refractory cement that did not contain asbestos. Access plates to boiler furnaces were sealed with woven asbestos gaskets. These gaskets were scraped off and replaced each time sailors

entered boiler furnaces to perform refractory inspections and clean the soot from boiler tubes (cleaning firesides).

Mr. Edwards testified he and Mr. Ankiel and other sailors would have to remove the covers to get inside the "firebox" (furnace) and noted this cover had a rope gasket around it. He recalled he and all of the sailors in the forward fire room removed and replaced gaskets on the boilers "constantly". (Deposition of Mr. Edwards, pp 46-47, 242-243)

Foster Wheeler drawing number NY-420-934-3 is titled *FURNACE BRICKWORK (tile installation).* This drawing states "This plan applies to DD 692 Class 2200 Ton Destroyers fitted with Foster Wheeler boilers". This plan is also referenced in the extensive list of drawings in the Foster Wheeler Instruction Book for DD 692 Class Destroyers with Foster Wheeler boilers, including HOLLISTER. The list of material on this plan includes the material for all four boilers on each Destroyer. 2140 pieces (535 per boiler) of class C high temperature insulating blocks meeting Navy specification 32I3 are required. Each block is 18 inches long by 6 inches wide by one inch thick. Specifications for this block were updated to MIL-I-2819 during the period Mr. Ankiel served aboard HOLLISTER (1975-1978). A Foster Wheeler list of approved materials for insulating block records MIL-I-2819, Class C records this material was a high temperature insulating block manufactured from calcined diatomaceous silica with asbestos fiber. This plan also requires 41 square feet (10 square feet per boiler) of asbestos millboard for each furnace.

The refractory materials in Navy boilers were exposed to temperatures as high as 2700 degrees Fahrenheit. Thermal block insulation, which was installed next to steel boiler casings and was the refractory layer farthest from the furnace flames, had an allowed maximum temperature of 1800 to 1900 degrees Fahrenheit. All of the layers of material in Navy boiler furnaces fused together during prolonged operational exposure to these high temperatures and were removed by breaking up the entire refractory and removing it in pieces from boiler furnaces.

When asked if he and Mr. Ankiel had to do anything with refractory that exposed them to dust, Mr. Orton responded when the refractory inside the furnace was cracked and needed replacement, "we had to clean that area up and take the old refractory out." He recalled a contractor would usually "come in and replace the refractory". Mr. Orton testified he and Mr. Ankiel and others were in the fire room when work was done by these contractors and noted we would clean it up at the end of every day. He estimated outside contractors did some type of refractory work about a half a dozen times. When asked how many times he saw Mr. Ankiel remove refractory material, Mr. Orton replied "I would say a couple times". He explained "I'm saying he might have taken out some of the loose stuff. So it's not like we replaced all the refractory in the boiler". Mr. Orton recalled refractory mortar was used to make these refractory repairs but did not recall the exact type of material. Mr. Orton estimated he spent about forty hours repairing refractory in the eighteen months he served aboard HOLLISTER. Mr. Orton testified Mr. Ankiel wire brushed all the pipes (tubes) inside the boiler furnace. He explained all of the surfaces inside the furnace (firebox) had to be brushed clean from accumulated soot. (Deposition of Mr. Orton, pp 79-81, 501-503, 513-518)

Mr. Edwards recalled others came in and dismantled the casings on the boiler to retube the boilers. He believed this exposed the fire room crew to insulation and gasket work. Mr. Edwards did not recall any refractory, other than "just repairs on some of the grout" removed in the forward fire room while he served aboard HOLLISTER. (Deposition of Mr. Edwards, pp 51-52, 241-242)

These boilers also had manholes in the steam drum and water drum and hand holes in headers to provide access for maintenance. These accesses were sealed with metallic-asbestos gaskets. Residue from these gaskets was scraped and brushed from sealing surfaces when manholes on steam and water drums were opened for inspection and to clean the water sides of boiler tubes.

Mr. Orton explained he and Mr. Ankiel and others had to remove over thirty hand-holes on each boiler and use special pneumatic wire brushes to clean off the gasket material from the gaskets used to seal these hand-holes. He stated he had to also do this for the manholes installed on the boiler steam and water drums. Mr. Orton testified he now knew the old hand-hole and manhole gasket material he and others removed was asbestos. When asked how often he saw Mr. Ankiel open a manhole cover, Mr. Orton replied "I will say a couple of times". Mr. Orton recalled the gasket for the manhole cover contained asbestos and was replaced each time the manhole cover was opened. Mr. Orton stated he believed Mr. Ankiel replaced all 30 hand-hole covers on each boiler, not at once, but at one time or another. Mr. Orton did not recall the name of the manufacturer of replacement hand-hole and manhole gaskets. (Deposition of Mr. Orton, pp 77-78, 500-504, 515-516)

Mr. Edwards stated headers on the Foster Wheeler boilers had hand-holes and manholes sealed with Flexatallic gaskets. He explained these gaskets were usually 'dried out and fried" to header surfaces and recalled he and Mr. Ankiel would have to scrape gasket residue off the headers. Mr. Edwards described Flexatallic gaskets as having metal wire spun around "insulation" material between each winding. He believed removing the residue from Flexatallic gaskets exposed him and Mr. Ankiel and others to asbestos. Mr. Edwards recalled he and all of the sailors in the forward fire room removed and replaced gaskets on the boilers "constantly". He believed these gaskets had been provided by the manufacturer of the boilers "because they fit on there perfectly". Mr. Edwards explained there were gaskets "on the steam drum and the hand-holes and the headers" in addition to gaskets on boiler access panels. He recalled gaskets would be replaced twice a year. (Deposition of Mr. Edwards, pp 47-50, 241-256)

Exposed portions of boiler steam drums, water drums, headers and down-comers were insulated and lagged with asbestos materials as recorded in a Navy Destroyer insulation drawing. At the beginning of his three days of deposition testimony, Mr. Orton recalled he and Mr. Ankiel did "very little work" associated with this insulation. Later, at the end of these three days, Mr. Orton stated he saw Mr. Ankiel disturb external insulation several times on a boiler to resolve a maintenance issue. He could not recall if Mr. Ankiel was removing or installing this insulation. Mr. Orton estimated he saw outside contractors replace insulation on the Foster Wheeler boilers "half a dozen times or more". He stated the fire room crew never left a fire room while outside contractors were working in that space. (Deposition of Mr. Orton, pp 79-80, 507-511)

When asked if he was able to say he and Mr. Ankiel and others in the fire room crew were exposed to asbestos from work they and others did on HOLLISTER's Foster Wheeler boilers, Mr. Orton replied "yes". (Deposition of Mr. Orton, pp 77-80)

When asked if he, Mr. Ankiel and other members of the fire room crew were exposed to asbestos from work he and others did on the Foster Wheeler boiler on HOLLISTER, Mr. Edwards responded "I believe so, yes". (Deposition of Mr. Edwards, pp 52-53)

Adding warning labels to machinery and equipment supplied to the Navy was easily accomplished and was not prohibited by the Navy. Foster Wheeler Drawing Number NY-420-907-2 (dated 11-18-43 & applicable to U. S. Navy DD 692 Class Destroyers with Foster Wheeler Boilers) requires that a warning plate concerning operation of drain and bottom blow valves be placed on each Foster Wheeler boiler. Drawing NY-420-907-2 was approved by the Navy. This warning states: *Note: 1" drain valve for 9 ¼ " O.D. S. W. Header and 1 ½ " bottom blow valve for 14" O.D.S.W. header to be equipped with a warning plate inscribed thus: "**USE ONLY WHEN ALL OIL BURNERS ARE SECURED".*** This warning was placed to preclude over-pressurization of these valves and their associated piping which might have resulted in a severe rupture causing damage to the boilers and possible injury to fire room sailors.

Mr. Orton testified "we" spent "quite a lot of time" inside the boilers on HOLLISTER any time there was a cracked pipe or cracked refractory. (Deposition of Mr. Orton, pp 368-369)

Vulcan Soot Blower Corporation drawing number 12458-1 records Vulcan manufactured one soot blower assembly for each of the four boilers installed on HOLLISTER. Drawing 12458-1 records each assembly was built with one compressed asbestos sheet gasket (Navy specification 33P13, symbol 2150) and two sizes of braided asbestos packing (Navy specification 33P26, symbol 1103).

When asked if Copes-Vulcan manufactured the soot blowers installed on HOLLISTER, Mr. Orton replied "Yes". He explained he was familiar with these soot blowers "because I worked on them". Mr. Orton believed these soot blowers were the original ones installed on Hollister. He stated he worked on gaskets and packing on these blowers but not the internal components. (Deposition of Mr. Orton, pp 67-68, 121)

Mr. Edwards testified the soot blowers on HOLLISTER were manufactured by Vulcan. He explained soot blowers cleaned the "outside of the tubes on the inside of the boilers" at periodic intervals "to get better efficiency on the heat transfer". He believed he and Mr. Ankiel were exposed to asbestos from replacing gaskets and packing on these blowers and noted they worked on these blowers quite often because Hollister was at the end of its life cycle. Mr. Edwards added he and others would also tighten up packing glands and any loose connections on these soot blowers. When asked if he specifically recalled working with Mr. Ankiel on soot blowers on HOLLISTER, Mr. Edwards replied "well he trained me - - "when I first went on board the ship". (Deposition of Mr. Edwards, pp 43-45, 82-87)

Eight Westinghouse, steam turbine driven, forced draft blowers were installed on HOLLISTER as recorded in the 1953 and 1960 INSURV reports. Two provided combustion air to each boiler and four forced draft blowers were installed in each fire room. Westinghouse plan numbers 20-J-924 and 20-J-

928 confirm Westinghouse manufactured the forced draft blowers installed on HOLLISTER. Westinghouse plan numbers 20-J-924 and 20-J-928 specify the use of asbestos sheet gaskets (Navy Specification 33P13, Symbol 2150) and metallic-asbestos gaskets (Navy Specification 33G5) internal to each forced draft blower assembly. A Navy insulation drawing for DD 692 Class Destroyers, including HOLLISTER, records the turbines for these blowers were insulated and lagged with asbestos materials. In addition the flanged steam piping connections to the turbines for these blowers were sealed with asbestos gaskets.

Mr. Orton testified Westinghouse manufactured the forced draft blowers installed on HOLLISTER and stated he recalled this since Westinghouse was "a big company here in Chicago". He stated these forced draft blowers were made with flanges sealed with gaskets. Mr. Orton also recalled isolation valves for these blowers had packing and believed these isolation valves were provided by the blower manufacturer. He replied "yes" when asked if he and Mr. Ankiel were exposed to asbestos from working on these blowers. (Deposition of Mr. Orton, pp 65-67)

Mr. Edwards explained forced draft blowers provided combustion air for the boilers on HOLLISTER. He recalled he and Mr. Ankiel would remove the pads on these blowers and replace gaskets and packing in them. Mr. Edwards noted he and Mr. Ankiel and others had to work on these forced draft blowers "quite often" because HOLLISTER was near the end of its service life. He testified the forced draft blowers installed on HOLLISTER were manufactured by Westinghouse. (Deposition of Mr. Edwards, pp 43-45)

The Griscom-Russell Company manufactured one quadruple G-fin fuel oil heater installed in each fire room on HOLLISTER. Griscom-Russell plan numbers NYE-1933 and NYE-1934 record Griscom-Russell manufactured the fuel oil heaters installed on DD 692 Class Destroyers and the 1953 INSURV report confirms this for HOLLISTER. These plans specify eight large (approximately 7" x 18") compressed asbestos sheet gaskets were required for each heater. A Navy insulation drawing for DD 692 Class Destroyers, including HOLLISTER, records these heaters were insulated and lagged with asbestos materials. In addition the flanged steam piping connections to these fuel oil heaters were sealed with asbestos gaskets.

One Warren 6" x 9" x 12" single cylinder reciprocating steam fire and bilge pump was installed in each fire room on HOLLISTER. Warren plan number BS-1195 records Warren manufactured these fire and bilge pumps for HOLLISTER. Plan BS-1195 documents these pumps were built with asbestos packing and gaskets. This packing included asbestos packing (John Crane #251) for the valves controlling steam flow to the steam chest. Warren plan BS-1196 for the fire and bilge pump records the steam chest and steam cylinder for each of these pumps was insulated with "85% magnesia", an insulating material that contains 85% magnesium carbonate and about 15% asbestos fiber. This insulation was applied and covered with metal lagging at the Warren manufacturing facility. In addition flanged steam piping connections to the steam cylinders for these pumps were sealed with asbestos gaskets.

One Warren 9" x 6 1/2" x 16" single cylinder reciprocating steam emergency feed water pump was installed in each fire room on HOLLISTER. Warren plan number BS5-1705 records Warren manufactured

emergency feed water pumps for HOLLISTER. Plan BS5-1705 documents these pumps contained asbestos packing. This packing included asbestos packing for the valves controlling steam flow to the steam chest. Warren plan BS5-1706 for the emergency feed water pump records the steam chest and steam cylinder for each of these pumps was insulated with "85% magnesia", an insulating material that contains 85% magnesium carbonate and about 15% asbestos fiber. This insulation was applied and covered with metal lagging at the Warren manufacturing facility. In addition flanged steam piping connections to the steam cylinders for these pumps were sealed with asbestos gaskets.

Mr. Orton testified Warren pumps were not on the list of equipment he prepared prior to his deposition but stated he certainly recalled these pumps when they were mentioned. When asked if he worked on Warren pumps if they were in his fire room he replied "Yes, we did". He gave the same reply when asked if he and Mr. Ankiel removed and replaced asbestos packing and gaskets on these pumps. Mr. Orton did not recall any details concerning the Warren pumps installed in the fire rooms on HOLLISTER. (Deposition of Mr. Orton, pp 531-544)

Two turbine-driven main fuel oil service pumps and one turbine-driven fuel oil transfer and booster pump were installed in each fire room on HOLLISTER. The SUPSHIP, New York letter dated 13 October 1943 records these pumps and the steam turbines driving these pumps were manufactured by the DeLaval Steam Turbine Company. DeLaval plan number G-10201 depicts the steam turbine assembly for the fuel oil service pump on DD 692 Class Destroyers. This plan specifies the use of a total of eleven rings of asbestos packing (Navy Specification 33P26, type B, symbol 1104) for steam valves provided by DeLaval as a part of the turbine assembly. DeLaval plan number G-10207 depicts the steam turbine assembly for the fuel oil booster pump on DD 692 Class Destroyers. This plan also depicts the use of a total of eleven rings of the same type of asbestos packing for steam valves provided by DeLaval as a part of each turbine assembly. The oil coolers for the turbines driving each of these pumps contained five compressed asbestos sheet gaskets as recorded on DeLaval plan number SG-3661. Based on industry practice, these pumps were attached to piping systems with flanged joints sealed with asbestos gaskets. A Navy insulation drawing for miscellaneous pumps records the steam turbines for fuel oil pumps on DD 692 Class Destroyers, including HOLLISTER, were insulated and lagged with asbestos materials.

Mr. Orton recalled DeLaval manufactured pumps installed on "pump row" in the fire rooms on HOLLISTER and testified "we did work on those pumps". He testified "I could tell you for a fact that we worked on all the equipment, that we changed all the flanges that we worked on, everything and - - broke everything down, I can tell you and put it back together". When asked what work Mr. Ankiel did on the DeLaval fuel oil service pumps, Mr. Orton responded "Everything. Everything. He worked on everything." He testified this included the fuel oil booster pumps. Mr. Orton stated Mr. Ankiel changed gaskets and packing on DeLaval pumps in the same manner as was described earlier in this report. He believed the gaskets and packing he and Mr. Ankiel removed and replaced included asbestos gaskets and packing. Mr. Orton believed the company that made the Delaval pumps also provided replacement gaskets for those pumps. Mr. Orton could not recall specific details concerning the DeLaval pumps installed in the fire rooms. (Deposition of Mr. Orton, pp 376-380)

After consulting the list he had prepared prior to his deposition, Mr. Edwards recalled he and Mr. Ankiel worked on DeLaval pumps in the forward fire room on HOLLISTER. He replied "yes" when asked if he and Mr. Ankiel had to take apart these pumps, including the pump casings, and get inside to overhaul the pumps. Mr. Edwards stated this included the replacement of gaskets and testified gaskets from different pump manufacturers were not interchangeable. He believed he and Mr. Ankiel were exposed to asbestos from work on DeLaval pumps. Mr. Edwards could not recall specific details concerning the DeLaval pumps installed in the forward fire room on HOLLISTER. (Deposition of Mr. Edwards, pp 33-40, 173-199)

Northern drawing number 4500-15-F665 records Northern manufactured hand driven fuel oil service pumps installed aboard HOLLISTER. One of these pumps was installed in each fire room. This drawing records the shafts for these pumps were sealed with 3 rings of braided asbestos packing, Navy symbol 1103.

Mr. Orton testified he and Mr. Ankiel worked on all of the equipment in the forward boiler room on HOLLISTER. He stated if Northern pumps were installed in the forward boiler room he and Mr. Ankiel worked on them. He did not recall any specific details concerning Northern pumps. Mr. Orton discussed rebuilding pumps and would likely have replaced any packing in any pump he rebuilt. (Deposition of Mr. Orton, pp 284-290)

Worthington manufactured one high pressure air compressor driven by a Sturtevant steam turbine which was installed in the after fire room on HOLLISTER. This is recorded in the 1953 and 1960 INSURV reports. It is likely Sturtevant utilized the same types of materials in the auxiliary steam turbines used to drive air compressors as they used in the auxiliary steam turbines used to drive pumps. Sturtevant drawing number D15-632-O depicts steam turbine drivers for pumps on ESSEX Class Aircraft Carriers. This drawing requires the use of 51 inches of braided asbestos rod packing (Navy Specification 33P26, Type B, Symbol 1104) and two compressed asbestos sheet gaskets (Navy Specification 33P13, Symbol 2150). The steam turbine for this air compressor was insulated and lagged with asbestos materials as recorded in a Navy DD 692 Class insulation drawing. Flanged steam piping connections to the turbines for these compressors were sealed with asbestos gaskets.

Mr. Orton and Mr. Edwards both testified the sailors working in the fire rooms on HOLLISTER shared a berthing compartment with the sailors working in the engine rooms on that Destroyer. They stated both the fire room sailors and the engine room sailors returned to the same compartment before they changed their clothing. Mr. Orton explained the clothing for both groups of sailors were often very dusty from their day's work in these machinery spaces. He agreed this situation allowed "cross-contamination" for both sets of sailors as it related to the source of asbestos dust on their clothing. Work clothing for enlisted sailors in the same berthing compartment was collected in very large laundry bags and taken to the ship's laundry on designated days. As a result it is likely the clothing for sailors assigned to the fire and engine rooms was co-mingled in these laundry bags. In addition Mr. Orton testified he and Mr. Ankiel and other sailors assigned to the fire rooms on HOLLISTER sometimes were sent to the engine rooms to help perform work in those two spaces. (Deposition of Mr. Orton, pp 60-62, 136-139; Deposition of Mr. Edwards, pp 57-59)

The 1953 and 1960 INSURV reports records Allis-Chalmer manufactured two sets of main propulsion steam turbines for HOLLISTER. Each set consisted of a high pressure turbine and a low pressure turbine with astern elements. One set was installed in each engine room. The steam propulsion turbines for DD 692 Class Destroyers were designed by the General Electric Company. GE drawing numbers WW8008625, WW8008626, WW8019175, WW8019176, WW8258423, WW 8608961, WW 8608969, WW 8608970 for DD 692 Class Destroyers indicate that asbestos sheet gaskets were used for attachments to turbine casings, for man-hole and hand-hole access plates and for the flanges of inter-connecting turbine piping provided with the turbines. Asbestos fiber insulation spacers and attached lagging clips were provided with the turbines to facilitate the installation of asbestos insulation and lagging.

DeLaval manufactured the main propulsion reduction gears installed on HOLLISTER as recorded in the 1953 and 1960 INSURV reports.

Worthington and Foster Wheeler both manufactured main and auxiliary condensers installed on DD 692 Class Destroyers. One main condenser and one auxiliary condenser were was located in each engine room. The 1953 INSURV report records the main and auxiliary condensers for HOLLISTER were manufactured by Worthington. The 1960 INSURV report records the main condensers for HOLLISTER were manufactured by Foster Wheeler and the auxiliary condensers were manufactured by Worthington. These main and auxiliary condensers were extremely durable items of machinery and were not likely replaced during the service life of HOLLISTER.

The SUPSHIP, New York letter dated 13 October 1943 records DeLaval manufactured lubricating oil service pumps driven by DeLaval steam turbines installed on HOLLISTER. Two of these pumps were installed in each engine room. DeLaval plan number G-10214 depicts steam turbines driving Destroyer lube oil pumps and records DeLaval utilized braided asbestos packing for the governor and nozzle valves which were an integral part of their turbines. The lube oil coolers which were also an integral part of these turbines each utilized five compressed asbestos sheet gaskets. Steam turbines driving lube oil pumps were attached to main steam piping by flanges sealed with spiral wound asbestos-metallic gaskets. These steam turbines were insulated and lagged with asbestos materials as recorded in Destroyer insulation drawings for miscellaneous pumps.

The DeLaval Separator Company manufactured two lubricating oil purifiers installed on HOLLISTER. One was installed in each engine room. This is recorded in the 13 October 1943 letter written by SUPSHIP, New York. The DeLaval Separator Company prepared an Instruction Book for Model 65N-13 lubricating oil purifiers installed on DD 692 Class Navy Destroyers, including HOLLISTER. This Instruction Book specifies operating temperatures and discharge pressures of these oil purifiers as 150 degrees Fahrenheit and 25 pounds per square inch gauge. These documents also indicate that these purifier units contained pump and housing plate gaskets (two gaskets for each purifier). Compressed asbestos sheet gaskets are the only practical choice for these gaskets based on Bureau of Ships Standard Plan B-153.

One Warren main condenser circulating pump driven by a Westinghouse steam turbine was located in each engine room on HOLLISTER. Warren plan number BS5-1417 records this. Warren plan BS5-1417 records Warren used asbestos containing packing for the pump rod packing on these pumps. Westinghouse drawing number 25-J-91 specifies the use of metallic-asbestos gaskets (Navy Specification 33G5) for components of the steam turbines for the main circulating pumps. Turbines driving these pumps were attached to steam systems with flanged joints sealed with asbestos gaskets. Navy Destroyer insulation drawings record asbestos materials were used to insulate and lag the turbines for these main circulating pumps. Steam turbines driving main circulating pumps were attached to main steam piping by flanges sealed with spiral wound asbestos-metallic gaskets.

Elliott Company Drawing number NH-30066 is titled: *246,500 LB per Hour Deaerating Feed Tank (DFT) Outline.* This drawing documents that all DFTs for DD 692 Class Destroyers were built to this drawing. Drawing NH-30066 specifies which of these tanks were manufactured by Elliott and which were manufactured by Cochrane to the Elliott design. This drawing indicates the DFTs for HOLLISTER were manufactured by Cochrane. Elliott drawing NH-30066 also contains note number 13 stating: "lagging and lagging clips to be furnished and installed by the shipyard". This note clearly indicates that Cochrane was aware that the DFT would be insulated and lagged. The Elliott Instruction Book for these DFT's documents that Cochrane used numerous compressed asbestos sheet gaskets as well as asbestos packing in the construction of the DFTs for HOLLISTER and in parts supplied with the DFT. A Navy Destroyer insulation drawing records these DFTs were insulated and lagged with asbestos materials.

Two turbine driven main feed pumps, two turbine driven main condensate pumps and one motor driven auxiliary condensate pump were located in each engine room on HOLLISTER. A 10 August 1943 Bureau of Ships letter and a DeLaval instruction book record DeLaval and Worthington manufactured main feed, main condensate and auxiliary condensate pumps for DD 692 Class Destroyers. These pumps were all manufactured using DeLaval drawings and DeLaval prepared the instruction books for these pumps. I have seen no records indicating which company manufactured the main feed, main condensate or auxiliary condensate pumps for HOLLISTER.

DeLaval plan numbers G-10228 and G-10241 for Destroyer main feed pumps document asbestos containing pump shaft packing (John Crane Superseal # 1), braided asbestos rod packing and five asbestos sheet gaskets were used in the manufacture of each main feed pump and its steam turbine driver. DeLaval plan G-10228 specifically notes that asbestos packing is to be used in the nozzle valve attached to the main feed pump turbine and provided with the main feed pump and turbine assembly. Both the main feed pump water casing and its turbine were insulated and lagged with asbestos materials as documented by a Navy Destroyer insulation drawing for main feed pumps. All feed pumps were connected to both steam and feed water piping systems with flanged joints sealed with spiral wound asbestos-metallic gaskets.

A DeLaval assembly sheet (G10068) for Destroyer main condensate pumps documents the use of asbestos sheet gaskets for the pump casing joint, the use of asbestos-containing packing to seal the pump shaft and the use of braided asbestos rod packing for governor and nozzle steam valves provided as a part of the turbine assembly. The turbines driving these pumps also were built with oil cooler

assemblies which contained asbestos gaskets as described for the DeLaval turbines driving lube oil pumps. These steam turbines were insulated and lagged with asbestos materials as recorded in a Destroyer insulation drawing for miscellaneous pumps. Condensate pump turbines were attached to steam systems with flanged joints sealed with spiral wound asbestos-metallic gaskets.

A DeLaval assembly sheet (G10194) for Destroyer auxiliary condensate pumps documents the use of asbestos sheet gaskets for the pump casing joint and the use of asbestos-containing packing to seal pump shafts.

The turbine driven main feed booster pumps and the motor driven auxiliary feed booster pumps were manufactured for DD 692 Class Destroyers by both DeLaval and Buffalo Pumps as indicated by DeLaval instruction books. These Pumps were all manufactured using DeLaval drawings and DeLaval prepared the instruction books for these pumps. I have seen no records indicating which company manufactured these pumps for HOLLISTER.

DeLaval plan number G-10083 records the steam turbines for Destroyer main feed booster pumps utilized braided asbestos rod packing for steam governor and nozzle valves provided as a part of turbine assemblies. DeLaval plan number G-10089 records the use of asbestos sheet packing material to seal pump casing joints and the use of asbestos packing to seal main feed booster pump shafts. The turbines driving these pumps also were built with oil cooler assemblies which contained compressed asbestos sheet gaskets as described for the DeLaval turbines driving lube oil pumps. A Navy Destroyer insulation drawing for miscellaneous pumps records both the main feed booster pump water casing and its turbine were insulated and lagged with asbestos materials. All feed pumps were connected to both steam and feed water piping systems with flanged joints sealed with spiral wound asbestos-metallic gaskets.

DeLaval plan number G-10188 for Destroyer auxiliary feed booster pumps records the use of asbestos sheet gasket material to seal pump casing joints and the use of asbestos packing to seal auxiliary feed booster pump shafts. A Navy Destroyer insulation drawing for miscellaneous pumps records the auxiliary feed booster pump casing was insulated and lagged with asbestos materials. These pumps were connected to the feed water piping system with flanged joints sealed with asbestos gaskets.

General Electric manufactured the ship's service generators for HOLLISTER as recorded in the 1953 and 1960 INSURV reports. Two of these generators were installed, one in each engine room. The turbines for these generators used asbestos packing (Navy Specification 33P26) to seal the stems of their steam valves based on GE drawing number WW8452395. These generators also used asbestos sheet gaskets (Navy Specification 33P13, Symbol 2150) for oil strainers, manifolds and coolers based on GE drawing numbers WW8453351 and WW8453352. Metallic-asbestos spiral wound gaskets were also used for high pressure connecting steam piping provided by Westinghouse with the turbine generators as documented by GE drawing number WW8453315. These same gaskets were used to seal flanges connecting the generator turbines to steam piping. These generators were insulated and lagged with asbestos materials as required by a Navy Destroyer insulation drawing.

Located in each engine room on HOLLISTER were one auxiliary condenser, one auxiliary condensate pump and one auxiliary condenser circulating pump. These items supported the generators. The auxiliary condensers and auxiliary condensate pumps were discussed earlier in this report.

The auxiliary condenser circulating pumps were manufactured by Buffalo pumps for HOLLISTER as indicated by Buffalo Pumps, Inc. *Combined Instruction Book for DD 692 Class Destroyers, Distilling Plant Pumps, Auxiliary Condenser Circulating Pumps and Fire and Flushing Pumps*. This Instruction Book documents Buffalo used asbestos containing pump shaft packing and asbestos sheet gaskets in the manufacture of these pumps. The auxiliary condenser circulating pumps were driven by electric motors.

One Griscom-Russell distilling plant with a capacity of 12,000 gallons per day was located in the forward engine room on HOLLISTER. A smaller Griscom-Russell distilling plant with a capacity of 4,000 gallons per day was located in the after engine room. These distilling plants are recorded in the 1953 and 1960 INSURV reports. The Griscom-Russell Instruction Book titled: *Description of and Operating Instructions for Soloshell L.P. Distilling Plant* records Griscom-Russell utilized compressed asbestos sheet gaskets and asbestos packing for sealing components provided by Griscom-Russell with Navy distilling plants. Distilling plants were insulated and lagged with asbestos materials based on a Navy Destroyer insulation drawing.

Buffalo Pumps manufactured the electric motor driven pumps that served these distilling plants on HOLLISTER. These included five pumps with similar names but different sizes and designs for each plant. Smaller pumps were used on the 4000 gallon per day plant. These pumps included: distiller fresh water distribution pumps, distiller condenser circulating pumps, distiller condenser condensate pumps, evaporator brine overboard discharge pumps and first effect tube nest drain pumps. The Buffalo Pumps *Combined Instruction Book for Distilling Plant Pumps, Auxiliary Condenser Circulating Pumps and Fire and Flushing Pumps* documents these pumps were manufactured by Buffalo for all DD 692 Class Destroyers, including HOLLISTER. This instruction book also documents that asbestos sheet gaskets and asbestos containing pump shaft packing were used in the manufacture of each of these ten pump designs.

One electric motor driven fire and flushing pump, one reciprocating steam fire and bilge pump and one electric motor driven fresh water pump were located in each engine room on DD 692 Class Destroyers, including HOLLISTER.

The fire and flushing pumps on HOLLISTER were manufactured by Buffalo Pumps as indicated by the Buffalo Pumps, Inc. *Combined Instruction Book for DD 692 Class Destroyers, Distilling Plant Pumps, Auxiliary Condenser Circulating Pumps and Fire and Flushing Pumps.* This instruction book also records Buffalo Pumps used asbestos containing pump shaft packing and asbestos sheet gaskets in the manufacture of these pumps.

As discussed in the paragraphs above Buffalo manufactured eight pumps installed in each engine room on HOLLISTER. Buffalo did not manufacture any pumps installed in the two fire rooms aboard HOLLISTER.

Mr. Orton consistently testified he and Mr. Ankiel worked on all of the equipment installed in the forward fire room aboard HOLLISTER. He agreed he and Mr. Ankiel worked on Buffalo pumps in the forward fire room. Even though Mr. Orton testified he and Mr. Ankiel sometimes helped work in the engine rooms, I consider it unlikely Mr. Orton correctly recalled working with Mr. Ankiel on Buffalo pumps while both men served aboard HOLLISTER. (Deposition of Mr. Orton, pp 138-139, 474-495)

Mr. Edwards agreed he worked on Buffalo pumps with Mr. Ankiel in the forward fire room aboard HOLLISTER. He did not testify that he worked on Buffalo pumps in any other location aboard HOLLISTER. I consider it unlikely Mr. Edwards correctly recalled working with Mr. Ankiel on Buffalo pumps while both men served aboard HOLLISTER. (Deposition of Mr. Edwards, pp 33-40, 275-296)

Warren manufactured one reciprocating steam fire and bilge pump installed in each engine room on HOLLISTER. This is recorded in Warren plan numbers BS-1195 and BS-1196. Materials utilized to manufacture, install and insulate these fire and bilge pumps were discussed in the section of this report which addresses machinery installed in the fire rooms on HOLLISTER.

The fresh water pumps for DD 692 Class Destroyers, including HOLLISTER, were manufactured by Warren Pumps as recorded on Warren plan number BS4-1624. One Warren fresh water pump was located in each engine room. Warren used asbestos sheet gaskets and asbestos containing pump shaft packing in the manufacture of these pumps as documented by this plan.

A low pressure air compressor manufactured by Worthington and driven by an electric motor was located in the after engine room on HOLLISTER as recorded in the 1953 and 1960 INSURV reports.

The 1953 and 1960 INSURV reports record Carrier manufactured two refrigeration plants installed in the refrigeration machinery room on HOLLISTER. Based on Bureau of Ships standard plan number B-153 requirements for Freon F-12 systems, it is likely internal components in the Carrier refrigeration plant compressors were sealed with compressed asbestos sheet gaskets.

Two General Electric emergency generators driven by General Motors diesel engines were installed on HOLLISTER as recorded in the 1953 and 1961 INSURV reports and a document titled *Description of Electrical installation with Performance Data*. Each diesel generator was installed in its own space, one forward and one aft. Compressed asbestos sheet gasket material (Navy Specification 33P13, Symbol 2150) was the preferred material for many gaskets used with Navy diesel engines. These include gaskets in piping systems used for fresh and salt cooling water piping, for gases of combustion in exhaust manifolds and for diesel oil.

One Warren saltwater circulating pump for an emergency diesel generator was installed in the port shaft alley on each DD 692 Class Destroyer, including HOLLISTER. This is recorded in Warren drawing number BS5-1524 which also records the casing for this motor driven pump was sealed with a compressed asbestos sheet gasket and the shaft for this pump was sealed with asbestos packing.

One DeLaval Separator diesel fuel oil purifier was located in the starboard shaft alley on each DD 692 Class Destroyer, including HOLLISTER. This purifier is the SUPSHIP New York letter dated 13 October 1943. Materials contained in DeLaval Separator oil purifiers were discussed earlier in this report.

Gardner Denver manufactured one 350 gallon per minute and one 750 gallon per minute emergency fire pump installed on DD 692 Class Destroyers as recorded in Gardner Denver drawings AIA 158110 and AIA 158A111. These pumps were located in the refrigeration machinery room forward and in a store room aft. These drawings record the shafts for these motor driven pumps were sealed with asbestos packing. I have reviewed numerous ship machinery records for DD 692 Class Destroyers and have never seen any records indicating Gardner Denver pumps were located in any spaces on these Destroyers other that in the locations noted in this paragraph.

Mr. Orton testified he did not recall seeing a Gardner Denver pump in any compartment other than a boiler room. He stated he did not have any information indicating Mr. Ankiel worked on a Gardner Denver pump in any location other than a boiler room. (Deposition of Mr. Orton, pp 136-155)

Most valve manufacturers were not required to prepare manuals for less complex valves but manufacturers' drawings for valves were delivered to the Navy and were carried in the engineering log room on Navy ships. These drawings contained material lists for all of the parts contained in each valve. Some valve manufacturers did prepare replacement parts lists and manuals for use by ship's crews in determining replacement parts, including asbestos gaskets and packing, for their products. An example of one of these documents is discussed later in this report.

Chapman drawings AL-27826-189 and AL-47033-189 record low pressure gate hull valves manufactured by Chapman were installed on DD 692 Class Destroyers. Hull valves were primarily located in engine rooms and fire rooms to provide sea water for cooling machinery. Asbestos packing (Navy symbol 1103) was used to seal the stems and compressed asbestos sheet gaskets (Navy symbol 2150) were used to seal the bonnets on these valves.

Crane drawing 22012 depicts alloy steel combination feed stop and stop check valves installed in the fire rooms on DD 692 Class Destroyers. Two of these valves were installed in each fire room. One controlled the flow of feed water to each boiler. This Crane drawing required the use of asbestos and wire jacket packing (Navy specification 33P25, Symbol 1108) to seal valve stem s and corrugated iron gaskets to seal valve bonnets.

Crane drawing 22405 depicts cast steel fuel oil suction valves used in the fire rooms on HOLLISTER. This drawing requires the use of braided asbestos packing (Navy specification 33P26, symbol 1104) to seal valve stems and the use of compressed asbestos sheet gaskets (Navy specification 33P13, symbol 2150) to seal valve bonnets. This drawing indicates Crane brand "Cranite" asbestos sheet bonnet gaskets were installed in these valves during manufacture.

Crane drawings 22128, 22139 and 22152 depict cast steel valves for use in low pressure auxiliary exhaust and gland sealing steam systems in the fire and engine rooms on HOLLISTER. These drawings require the use of braided asbestos packing (Navy specification 33P26, symbol 1104) to seal valve stems

and the use of compressed asbestos sheet gaskets (Navy specification 33P13, symbol 2150) to seal valve bonnets. These drawings indicate Crane brand "Cranite" asbestos sheet bonnet gaskets were installed in these valves during manufacture.

Crane drawings 22388, 22389, 22391, 22414 and 22419 depict bronze valves for use in auxiliary steam and auxiliary exhaust systems in the fire and engine rooms on HOLLISTER. These drawings require the use of braided asbestos packing (Navy specification 33P26, symbol 1104) to seal valve stems and the use of compressed asbestos sheet gaskets (Navy specification 33P13, symbol 2150) to seal valve bonnets. These drawings indicate Crane brand "Cranite" asbestos sheet bonnet gaskets were installed in these valves during manufacture.

Crane catalog number 60 advertises Cranite is "an asbestos composition manufactured solely for Crane". This catalog explains "Cranite sheet packing is made from an asbestos composition. The selected long fiber asbestos, cross laminated to provide unusual tensile strength, offers uniform and very high resistance to compression, is exceptionally strong and rugged, and will not deteriorate with age."

Crane drawings 22172, 22173, 22174, 22175, 22234, 22235, 22300, and 22301 depict alloy steel valves for use in auxiliary steam systems in the fire and engine rooms on HOLLISTER. These drawings require the use of asbestos and wire jacket packing (Navy specification 33P25, Symbol 1108) to seal valve stems and corrugated iron gaskets to seal valve bonnets.

Crane drawing 22423 depicts a 600 psi cast allot steel angle valve for use in the main steam system in the fire and engine rooms on HOLLISTER. This drawing requires the use of asbestos and wire jacket packing (Navy specification 33P25, Symbol 1108) to seal valve stems and corrugated iron gaskets to seal valve bonnets.

Crane drawings 17232, 17233 and 22469 depict valves utilized in feed water and condensate systems in the fire and engine rooms on HOLLISTER. These drawings require the use of asbestos and wire jacket packing (Navy specification 33P25, Symbol 1108) to seal valve stems and metallic gaskets to seal valve bonnets.

Foster drawing AA-23134 depicts pressure regulating valves for the auxiliary steam to DFTs installed in the engine room on DD 692 Class Destroyers, including HOLLISTER. These valves used asbestos packing (symbol 1103) and asbestos bonnet gaskets (symbol 2150).

The Fulton Sylphon Company manufactured temperature regulating valves installed on DD 692 Class Destroyers. These valves, depicted on Fulton Sylphon drawing number 6092-R, used asbestos packing and asbestos bonnet gaskets (symbol 2150). Mr. Orton was emphatic in his belief that he and Mr. Ankiel worked on Fulton Sylphon valves but did not recall any details after about forty five years. (Deposition of Mr. Orton, pp 116-117)

Drawings prepared by the Hancock Division of Manning, Maxwell and Moore record valves this company manufactured which were installed on DD 692 Class Destroyers. Drawing number 555-31966 records

600# forged steel globe valves with asbestos packing and steel gaskets likely used in both fire and engine rooms on HOLLISTER. Drawing numbers 557-49340 and 557-49350 record angle blow off valves with asbestos packing used in fire rooms.

Jerguson drawing H-W-17 depicts reflex gages and valves for the deaaerating feed water tanks (DFTs) installed in the engine rooms on DD 692 Class Destroyers. One DFT and one set of gages were installed in each engine room. Each set of these used six compressed asbestos sheet gaskets (Navy specification 33P13, symbol 2150) to seal three gage glasses and the two valves for these gages were sealed with asbestos valve stem packing.

Jerguson drawing H-O-42 depicts the gages and valves for steam separators which were installed in the fire rooms on DD 692 Class Destroyers. Compressed asbestos sheet gaskets (Navy specification 33P13, symbol 2150) were used to seal the gage glasses to the bodies of these gages. Two glasses and four asbestos gaskets were used for each gage assembly. Asbestos packing (Navy specification 33P25, symbol 1108) was used to seal the stems of the three valves used for each gage assembly.

Jerguson drawing E-151 depicts 10 inch boiler water gages with valves for the boilers on HOLLISTER. Two boilers and two sets of these gages were installed in each fire room. Compressed asbestos sheet gaskets (Navy specification 33P13, symbol 2150) were used to seal the gage glasses to the bodies of these gages. Two glasses and four asbestos gaskets were used for each gage assembly. Asbestos packing (Navy specification 33P25, symbol 1108) was used to seal the stems of the two valves used for each gage assembly.

Mr. Orton testified he was familiar with Jerguson gauges installed on HOLLISTER. He recalled these gauges were connected to piping with flanges that were sealed with gaskets. Mr. Orton also stated there was “a gasket between the gauge and the glass and also from the top of the gauge and the bottom of the gauge, which you know more or less held it in place.” He explained gauge glasses needed to be replaced when broken, cracked or discolored, not at preset intervals. Mr. Orton stated he removed and replaced these gaskets as well as repacking the isolation valves for these gauges. He replied “yes” when asked if he and Mr. Ankiel were exposed to asbestos from working on these gauges. (Deposition of Mr. Orton, pp 64-67, 449-453)

Mr. Edwards recalled he, Mr. Ankiel and others would have to remove and tear apart Jerguson gauges each year as a part of a calibration process. He testified this included removing asbestos gasket material. Mr. Edwards remembered these gauges were taken to a Naval Air Station to be calibrated. Mr. Edwards estimated it took about fifteen minutes to remove Jerguson gauges for calibration and about the same amount of time to reinstall them when calibration had n been completed. He replied “yes” when asked if he got the name Jerguson as the result of an internet search for equipment installed on HOLLISTER. (Deposition of Mr. Edwards, pp 53-54, 131-138)

A Leslie document titled *Leslie Pump Governors and Pump Governor Parts Installed on U. S. Navy Surface Vessels* records Leslie manufactured constant pressure pump governors installed on the turbine driven main feed and lube oil service pumps in the engine rooms on HOLLISTER. This document also records DD 692 Class Destroyers for which Leslie manufactured governors for fuel oil service pumps and fuel oil

booster pumps. HOLLISTER is not included on this list. Leslie drawing PNS-200-18 is specifically applicable to DD 692 Class Destroyers and records Leslie utilized asbestos packing (Navy symbol 1104) and monel filled asbestos gaskets in main feed pump governors. Leslie drawing PNS-136-22 depicts governors for lube oil pumps and utilizes the same materials as PNS-200-18. Details on Leslie drawings indicate "monel filled" asbestos gaskets were circular gaskets with an inner layer of asbestos sandwiched between two thin monel discs. The asbestos in these gaskets was not encapsulated but was easily exposed when these gaskets were removed.

Lonergan drawing number E-522 records relief valves for the DFTs with asbestos packing and sheet asbestos bonnet gaskets were installed in the engine rooms on HOLLISTER. The stem for each of these valves was sealed with asbestos packing (Navy symbol 1103) and the bonnet for each of these valves was sealed with a compressed asbestos sheet gasket (Navy symbol 2150). This plan is applicable to DD 692 Class Destroyers, including HOLLISTER.

Swartout drawing FF-2798 depicts 5 inch diameter stop and unloading valves for the auxiliary condensers installed in the engine rooms on DD 692 Class Destroyers. Swartout drawing FF-2797 depicts 6 inch diameter stop and unloading valves for the main condensers installed in the engine rooms on DD 692 Class Destroyers. One of each of these valves was installed in each engine room. Each valve manufactured using plan FF-2797 and FF-2798 required one asbestos sheet bonnet gasket (Navy symbol 2150) and one set of asbestos stem packing (Navy symbol 1108).

When asked if he ever worked on A Spirax-Sarco steam trap, Mr. Edwards replied "if it was in the fire room we worked on them". He recalled he tore apart and cleaned steam traps as it related to steam traps in general. Mr. Edwards agreed this work was with flange gaskets. When asked if he worked on steam traps with Mr. Ankiel and Mr. Orton, Mr. Edwards responded Mr. Ankiel and Mr. Orton "were the two guys that trained me. I would say they were probably showing me all the time". When asked if he believed Spirax-Sarco willfully did anything to harm him or Mr. Ankiel, Mr. Edwards replied "Other than the fact they didn't tell us what was in the gasket material, no". When asked if Spirax-Sarco willfully misrepresented facts, Mr. Edwards responded "I believe they might have been negligent in disclosing". (Deposition of Mr. Edwards, pp 125-129)

As discussed earlier in this report, Mr. Orton listed Armstrong and Velan steam traps as products on which he worked during his four years of service in the Navy. Mr. Orton explained a steam trap separates water from the steam in piping systems "so you're not pushing a bunch of water through the pipe". He said he, Mr. Ankiel and others in the fire room crew worked on steam traps all the time and noted "you have to have a lot of steam traps". Mr. Orton stated some of these steam traps had bleeder valves but recalled most had to be taken apart and cleaned. He explained both the flanges connecting traps to piping systems and trap caps were sealed with gaskets which had to be removed and replaced. When asked if he believed the fire room crew including Mr. Ankiel were exposed to asbestos from work on steam traps Mr. Orton replied "yes". He stated he worked on both Armstrong and Velan traps about the same amount of time. (Deposition of Mr. Orton, pp 81-87)

Mr. Orton testified Armstrong steam traps were located in the boiler rooms on board HOLLISTER. When pressed for an estimate he estimated there were "at least a dozen steam traps total". He stated he had no knowledge that Mr. Ankiel may have worked on Armstrong steam traps in any other location other than in a boiler room. Mr. Orton did not recall the exact type or design of the Armstrong traps on which he worked. Mr. Orton believed the Armstrong steam traps were original equipment on HOLLISTER. He noted these steam traps were flanged into piping systems since they needed to be removed for maintenance. Mr. Orton testified he and the other sailors in the fire rooms would usually remove steam traps from piping for planned maintenance, test the trap and replace the gaskets on the top and flanges of the trap. Mr. Orton described cleaning gasket sealing surfaces in the same manner as was described for gaskets earlier in this report. He recalled steam traps would occasionally be sent to a shop for calibration or spring replacement. Mr. Orton said he and others would make gaskets for Armstrong steam traps in those cases where premade gaskets were not available. He believed replacement premade gaskets came in packaging with the manufacturers' names on them. (Deposition of Mr. Orton, pp 164-195)

Mr. Edwards testified he worked on Armstrong steam traps while serving aboard HOLLISTER. He did not recall what type of Armstrong steam traps were installed on HOLLISTER or other details concerning these traps. Mr. Edwards noted steam traps had to be isolated in order to work on them safely. He stated he opened Armstrong steam traps and cleaned them and remembered these Armstrong steam traps had a round gasket sealing the top cover. (Deposition of Mr. Edwards, pp 139-149)

The Velan *US Navy Reference List* records Velan manufactured both valves and steam traps installed on a number of new Navy ships commissioned from 1953 to 2003. This Velan document also states Velan provided their products to the Navy for overhauls as well but does not list the ships that received Velan products during overhauls. This list does not include any reference to USS HOLLISTER or any other DD 692 Class Destroyer. This list states "originally patented in 1953, Velan's unique Bimettalic steam trap quickly became a standard on US Navy vessels". Mr. A. K. Velan, the founder of Velan, Incorporated, provided testimony concerning Velan products, including steam traps, in a deposition given on 30 September 2004 for the Waddell Case (No. 080-68-6577) in New York County, New York. Mr. Velan testified that he personally designed all of the models of Velan steam traps (p 21). He testified that "a very large quantity of Velan steam traps were used in the Navy – "maybe 20,000 a year or more" (p 38). Mr. Velan testified that Velan used asbestos sheet gaskets in their products in the 1950s but later used Flexitallic spiral-wound asbestos metallic gaskets for most applications (p 47). He stated that sheet gaskets continued to be used for Velan steam traps in heating systems (p 88). Mr. Velan testified that Velan prepared maintenance manuals for its products but did not issue warnings concerning asbestos hazards (p 64).

When asked if he recalled Velan valves as being present in the forward fire room on HOLLISTER, Mr. Orton replied "Yes, I do". Mr. Orton stated most of the Velan valves on HOLLISTER were insulated with wired-on removable pads. He incorrectly believed Velan steam traps were insulated and that Velan traps and valves were original equipment installed on HOLLISTER when she was built. Mr. Orton believed he and Mr. Ankiel worked on Velan valves and steam traps because they worked on all of the equipment in the forward fire room on HOLLISTER. (Deposition of Mr. Orton, pp 292-325)

Mr. Edwards stated he was familiar with a company named Velan and recalled he associated Velan with steam traps. He stated Velan was on the equipment list while he was doing internet research for equipment on HOLLISTER and said "we worked on everything that was in the fire room". He included Mr. Ankiel in this work in a fire room on HOLLISTER. (Deposition of Mr. Edwards, pp 150-165)

Mr. Orton was asked a number of questions concerning products made by Yarway. He responded "No" when asked if Yarway products were more prevalent than other company's products and recalled Yarway sight glasses and "some valves". When pressed Mr. Orton agreed he worked on Worthington pumps even though no Worthington pumps were installed in the fire rooms on DD 692 Class Destroyers. When pressed concerning how much work he did on Rockwell valves he said: "a lot. Well I have no idea. I mean we worked on everything all the time". Mr. Orton did not recall working on Edward valves. He stated he knew he and Mr. Ankiel had worked on Nordstrom and Vogt valves but did not recall details. Mr. Orton had no firm knowledge concerning Robertshaw products. Mr. Orton did not have exposure to and did not recall maintenance histories for any of the machinery or valves in fire rooms on HOLLISTER. Mr. Orton testified repeatedly that he and Mr. Ankiel were best friends and very often worked on the same equipment together while serving in a fire room on HOLLISTER. (Deposition of Mr. Orton, pp 97-116)

Valves were bolted into steam, feed water and fuel oil piping systems with flanges sealed by asbestos gaskets. Bodies of valves in steam and other hot systems were insulated and lagged with asbestos materials as depicted on a Navy Destroyer insulation drawing for DD 692 Class Destroyers.

Adding warning labels to valves supplied to the Navy was easily accomplished. On 6 March 1983 the Crane Company issued drawing number 3150677, titled *Asbestos Cautionary Tag.* This drawing depicts a tag suitable for attachment to any valve. The lettering on this tag states: "CAUTION Contains Asbestos Packing or Gasket". In his deposition of 18 May 2004, pages 64 to 67, Mr. Harry Farley, a former Crane Company employee, discusses the use of this tag and states that these tags were placed on Crane valves in the early 1980s so proper cautions could be taken before valves were disassembled.

Sales of Asbestos Replacement Components to the Navy and to Shipyards for Navy Ship and Submarine Overhauls and Repairs

As stated earlier in this report, I spent two years as a program manager for Navy overhauls in a United States Naval Shipyard. A substantial portion of this time was spent on planning future overhauls. One part of this planning process was conducting weekly material status meetings with shipyard purchasing agents to monitor the ordering and delivery of repair parts needed during each overhaul. Repair parts for machinery such as pumps and valves were normally purchased directly from the original equipment manufacturers since all of the items necessary for overhauling each item of machinery was available from a single source. This made the ordering and tracking of repair materials simpler and more efficient. Repair parts needed included metallic parts such as pump wearing rings and valve seats as well as non-metallic parts including gaskets and packing. Sales documents discussed later record original equipment

manufacturers sold metallic and asbestos-containing replacement parts directly to the Navy for overhauls and to stock for repairs made by sailors to their equipment.

It should be noted that manufacturers and other companies were not required to be on QPLs in order to sell materials directly to the Navy. In July 1963 the General Services Administration published a *Guide to Specifications and Standards of the Federal Government.* This guide states the following concerning Qualified Product Lists (QPLs):

a. QPLs are prepared only for those specifications which require pre-qualification tests
b. QPLs are NOT intended to limit or exclude any prospective bidder
c. Manufacturers are NOT permitted to advertise or publicize the fact that their product appears on a QPL.

The United States government replied to interrogatories in the case of GAF Corporation v. the United States of America in the United States Claim Court, Civil No. 287-83-C. The U.S. Government response to interrogatory number 28 states "there were no QPLs prior to 1952. Furthermore not every specification requires the use of QPLs. Finally, it is not necessary to be listed on a QPL to be eligible to bid."

The following paragraphs present sales records for asbestos repair components to the Navy by companies that manufactured machinery installed on HOLLISTER. This equipment was identified earlier in this report.

A number of documents record the Crane Company sold replacement packing for their valves directly to Naval Shipyards for repairs to ships made by these yards and directly to ships for use by sailors making repairs to valves on the ships on which they served. Crane also sold replacement packing and bonnet gaskets to the Navy Ship Parts Control Center (SPCC) in Mechanicsburg, Pennsylvania.

SPCC was the Navy organization responsible for determining all of the repair parts and tools necessary for repairing the machinery, valves and other equipment installed on many different classes of Navy ships. SPCC was responsible for ensuring necessary repair parts were stocked in each of the Navy's regional supply centers which are located on both coasts and in Pearl Harbor, Hawaii as well as in selected foreign ports in close proximity to Navy home ports. SPCC tracked issues of each of these spare parts from supply centers to ships in active service and ordered replacement parts. Many of the replacement parts for machinery and valves were ordered from OEMs such as Crane.

A copy of the Crane Company *Master Parts Book* for Crane relief, back pressure, spring loaded and combination feed stop and stop check valves as well as for Crane strainers was found in the engineering log room onboard USS KIDD (DD 661) the museum ship berthed in Baton Rouge, Louisiana. This book contained a Bureau of Ships file number indicating it was a common reference document utilized on Navy ships. Drawing numbers found throughout this book indicate the Crane valves covered by this book were installed on ESSEX Class Aircraft Carriers, Battleships, Cruisers and the SUMNER, GEARING and FLETCHER Classes of Destroyers. Since many of the Crane valves depicted in the *Master Parts Book*

were very large, durable and expensive valves they were repaired but not replaced during the service lives of these ships. The Crane *Master Parts Book* remained an active Navy reference source long after Mr. Ankiel was detached from the Navy. Many of the GEARING Class Destroyers remained in service until the 1980s and USS LEXINGTON (CV 16), the last of the ESSEX Class Aircraft Carriers, remained in active service until November 1991.

In the forward to their *Master Parts Book*, Crane stresses the importance of using manufacturer's part numbers to order replacement parts for valves. The Crane *Master Parts Book* states "Extreme care should be exercised when writing requisitions or purchase orders for spare or replacement parts…Always specify at least the quantity, the part number and the manufacturer's name." An example given in this book to illustrate this point is the following minimum information "1 piece-Crane Part No. A675".

The Crane Company *Master Parts Book* contains parts listings for valves depicted on Crane drawings 22012, 22128 and 22139 which depict valves installed on HOLLISTER and discussed earlier in this report. The Crane *Master Parts Book* was likely carried in the engineering log rooms on HOLLISTER and used to order replacement parts for Crane valves.

Six Pearl Harbor Naval Shipyard (PHNSY) material inspection request forms dated from 1963 to 1967 document Crane Company supplied precut asbestos packing rings to PHNSY.

A 21 May 1970 Crane letter and a 19 June 1970 Crane shipping order with supporting documents record Crane sold four sets (six rings per set) of Crane part number A-3470 packing and four sets (six rings per set) of Crane part number A-3472 valve stem packing to PHNSY. Crane material list A-36166 records part numbers A-3470 and A-3472 denote braided asbestos packing.

A 10 July 1970 order was placed by PHNSY to the Crane Company for John Crane style number 187I packing which contains asbestos as recorded in a John Crane Houdaille catalog.

Crane Company shop order dated 1 November 1967 records Crane Company sold replacement packing directly to SPPC for use at Puget Sound Naval Shipyard aboard USS SAMPLE (DE 1048).

A Crane Company shop order dated 19 November 1965 records Crane Company sold braided asbestos replacement packing for twelve inch diameter 400 psi gate valves directly to USS RANGER (CVA 61).

A series of documents prepared by the Crane Company and SPCC record the interaction between Crane and the Navy concerning the procurement of replacement valve gaskets. This series of documents begins with a request for quotation from SPCC to Crane containing a procurement specification dated 10 September 1969 for 719 bonnet gaskets for a ¼" 600 psi angle valve. This procurement specification states "to be in accordance with Crane Company drawing 29963, piece 9, part number LC 11371". This clearly documents the Navy used Crane drawings to identify and order replacement parts for their valves. Crane Company responded to this request for quotation with a quotation dated 6 October 1969 for $467.35 with delivery to be 90 days after placement of the order. On 16 January 1970, SPCC placed an order for these bonnet gaskets with Crane Company with delivery required 26 April 1970. The order was to be shipped to two locations: 426 gaskets to Charleston, South Carolina and 293 gaskets to

Bremerton, Washington. The Navy operated Naval Shipyards, which performed overhauls and repairs on Navy ships, and Navy Supply Centers at both of these locations in 1970. On 10 March 1970, Crane Company acknowledged this order with a request for the preservation and packing code for this order. This correspondence identified the bonnet gaskets as "type 316 stainless steel with asbestos filled per MIL-G-21032, Type 1". A Crane shipping document (MS-66061) with an expected delivery date of 26 April 1970 records 293 of these bonnet gaskets were shipped to Bremerton and 426 were shipped to Charleston.

A Crane Company Shop Order dated 22 September 1966 records Crane Company sold 211 sets of Crane part number A-3473 packing to SPCC. Crane parts list A-36166 records part number A-3473 denotes braided asbestos packing. Crane shipped 15 sets to Pearl Harbor, 35 sets to Portsmouth, 82 sets to Charleston, 30 sets to Oakland, 15 sets to San Diego and 34 sets to Norfolk.

A Crane Company shop order dated 20 July 1972 records Crane Company sold 67 sets (9 rings each set) of precut packing (Crane part # A-3480) for an eight inch diameter 600 psi gate valve to the Navy Ships Parts Control Center (SPCC). Six sets were shipped to Charleston, South Carolina, likely to either the Charleston Naval Shipyard or to the Navy Supply Center. Sixty one sets were shipped to the Navy Supply Center in Oakland, California. It is likely these sixty one sets were used to replenish on board spares on Navy ships and submarines in the Pacific Fleet. A Crane drawing (21271) for a 600 psi steel gate valve requires nine rings of plastic asbestos wire jacket stem packing (Navy symbol 1108). It is likely Crane part number A-3480 is this same type of asbestos packing.

A Crane Company shop order dated 5 April 1976 records Crane Company sold 249 sets (9 rings each set) of precut asbestos packing (Crane part # A-3480) to SPCC. These sets were shipped to four locations where Navy Supply Centers for submarines and surface ships were located. It is likely these 249 sets were used to replenish on board spares on Navy ships and submarines in the Atlantic and Pacific Fleets.

A letter written by the Crane Company to the Navy Procurement Office, Philadelphia, Pennsylvania on 22 May 1973 and supporting documents acknowledged an order specifically for onboard repair parts for a 4 inch, 1500 psi valve depicted by Crane drawing 27441. These repair parts included metallic parts as well as one set of asbestos packing (11 rings per set – Crane part # 3180). A Crane company material list (Crane B-102075), contained in this package of documents, confirms the packing for Crane drawing 27441 requires 11 rings of braided asbestos packing.

Foster Wheeler sold asbestos-containing replacement parts for use on Navy ships.

A Bath Iron Works (BIW) purchase order dated 8 February 1967 records Foster Wheeler sold 824 metallic asbestos spiral wound oval, hand-hole and elliptical manhole gaskets to BIW for use on the Navy Guided Missile Destroyer Escort USS RICHARD L. PAGE (DEG 6). The Foster Wheeler drawing number and drawing piece numbers for these items were quoted indicating that BIW used Foster Wheeler drawings to identify and order replacement materials for Foster Wheeler boilers. BIW receiving documents dated 28 February 1967, 2 March 1967 and 14 March 1967 record these gaskets were received at BIW.

A Bath Iron Works (BIW) purchase order dated 12 May 1969 records Foster Wheeler sold 96 metallic asbestos spiral wound hand-hole gaskets to BIW for use on the Navy Guided Missile Frigate USS REEVES (DLG 24). A Foster Wheeler shipping manifest dated 5 June 1969 records 100 hand-hole gaskets were shipped to BIW marked for REEVES.

A Foster Wheeler sales document dated 7 July 1971 records Foster Wheeler sold 256 oval metallic asbestos spiral wound hand-hole gaskets to BIW for use on the overhauls of USS RICHMOND K. TURNER (DLG 20) and USS HALSEY (DLG 23).

Foster Wheeler sold a number of single copper jacketed asbestos gaskets of the same dimension (3/32" thick x 4 1/16 "inside diameter, 7 ¼ "outside diameter, with four 9/16" diameter holes equally spaced on a 6 in diameter bolt circle) to Naval Shipyards and to Navy and DOD supply centers. These parts were used on the boilers of DD 692 Class Destroyers such as HOLLISTER.

a. Bates 149: 18 gaskets to New York Naval Shipyard, 18 April 1962
b. Bates 150: 18 gaskets to Mare Island Naval Shipyard, 28 March 1962
c. Bates 153: 8 gaskets to Norfolk Naval Shipyard, 4 May 1960
d. Bates 168/611: 18 gaskets to Long Beach Naval Shipyard, 9 August 1961
e. Bates 182: 18 gaskets to Norfolk Naval Shipyard, 23 June 1960
f. Bates 195: 18 gaskets to Norfolk Naval Shipyard, 12 July 1960
g. Bates 357-372 & 1324-1340: 270 gaskets to DOD Supply Center, Columbus Ohio; 31 gaskets to DOD Depot, Ogden, Utah, September 1975
h. Bates 461: 555 gaskets to DOD Supply Center, Columbus, Ohio, 30 July 76
i. Bates 549: 441 gaskets to Naval Supply Center, Norfolk, Virginia, 23 November 1977
j. Bates 653: 18 gaskets to Puget Sound Naval Shipyard, 20 December 1961
k. Bates 706: 18 gaskets to Boston Naval Shipyard, 26 March 1962
l. Bates 1500-1512: 134 gaskets to Naval Supply Center, Norfolk; 307 gaskets to DOD Supply Center , Columbus, Ohio, 13 January 1978
m. Bates 1778-1785: 26 gaskets to Keystone Bolt and Nut Company, Chalfont, PA for use on DD 692 Class Destroyers, 15 January 1981
n. Bates 2348: 4 gaskets to Philadelphia Naval Shipyard, 30 July 1965

Warren provided asbestos-containing replacement parts for their pumps for use during overhaul of Navy ships.

Pearl Harbor Naval Shipyard (PHNSY) placed an order to Warren Pumps on 3 October 1978 for a number of replacement parts for centrifugal and reciprocating pumps. These included metallic parts, eight rings of braided asbestos packing (symbol 1103), one asbestos sheet pump gasket (symbol 2150) and one asbestos shaft sleeve washer. This order was initiated by three job material lists prepared by shipyard planners (code 237M) for pumps installed on USS RATHBOURNE (FF 1057) and USS PONCHATOULA (AO 148).

PHNSY placed an order to Warren Pumps on 15 September 1978 for one asbestos shaft sleeve gasket for a centrifugal pump. This order was initiated by a job material list prepared for a water heater drain pump installed on USS STRAUSS (DDG 16).

PHNSY placed an order to Warren Pumps on 21 December 1976 for a number of replacement parts for two reciprocating steam pumps. These included metallic parts and four CST gaskets. This order was partially initiated by two job material lists prepared for an emergency feed pump installed on USS ASHTABULA (AO 51).

A Bath Iron Works (BIW) purchase order dated 3 May 1968 records Warren sold two pieces of asbestos sheet gasket material to BIW for use an overhaul on the Navy Guided Missile Frigate USS HARRY E. YARNALL (DLG 17). The Warren drawing number for this item was quoted indicating that BIW used the Warren drawing to identify and order replacement materials for Warren pumps.

Navy Insulation, Gasket and Packing Controls during Mr. Ankiel's Navy Service

Mr. Ankiel served aboard HOLLISTER between 31 October 1975 and 16 April 1978. As discussed in this section of my report, asbestos packing and gaskets were in use in the Navy for all of the time Mr. Ankiel served aboard HOLLISTER.

The installation of new asbestos insulation for ship construction or repair was prohibited in October 1975 but asbestos insulation installed before that date remained on Navy ships and submarines long after that date. As detailed later in this section, strict controls for asbestos insulation removals began in July 1978.

Note the Navy Bureau of Ships, which had been established in 1940, was replaced by the Naval Ships Systems Command in 1966 and this organization became the Naval Sea Systems Command in 1974 after a merger with the Naval Weapons Systems Command. The Navy's Ship Engineering Center was a subordinate command to the Naval Ships Systems Command and was later mostly absorbed by its parent command.

Captain W. R. Riblett, Code 6100 in the Navy's Ship Engineering Center (SEC), wrote a memo dated 9 December 1968 to Code Ships 07 in the Naval Ships System Command concerning "Hazards of Asbestos". The ten United States Naval Shipyards operating in 1968 reported to Ships 07. This memorandum stated Naval Shipyards had begun using fiberglass and other materials in place of asbestos materials for insulation whenever possible and had instituted "appropriate safety precautions" including respirators for insulators performing "rip-out" of asbestos insulation. He noted private shipyards "still use substantial amounts of asbestos insulation" and stated the prohibition on the use of asbestos (insulation) for new construction and repair was "being considered". Captain Riblett noted asbestos packing and gaskets were fabricated with "binders" and not considered friable when cut. He did not discuss removal of old gaskets and packing. Captain Riblett flatly stated "packings and gaskets containing asbestos are not considered to be a significant health hazard".

A Naval Sea Systems Command instruction dated 24 October 1975 was titled "Asbestos Elimination/Substitution/Personnel Protection Program". The paragraph titled "Policy" states "Asbestos and the materials containing asbestos shall not be used in the construction, overhaul, repair and maintenance of naval vessels nor shall such materials be used in any facility or operational application where suitable alternative materials have been designated. However, in locations where asbestos

materials are presently installed, rip-out operations shall not be performed for the sole purpose of eliminating asbestos." This policy paragraph continues "This instruction applies to all asbestos containing materials but the implementation details are currently available for thermal insulation only. As additional substitute materials are developed, appropriate specification and instruction revisions shall be made for implementation of this policy". The final section of this policy paragraph stated "personnel working with asbestos shall be provided with, and be required to use, protections and safeguards in accordance with reference (e). Reference (e) was OPNAVINST 6260.1 dated 9 April 1974 and titled "Control of Asbestos Exposure to Naval Personnel and Environs".

The 1974 edition of OPNAVINST 6260.1 based the requirement to control asbestos exposure on those processes which caused airborne concentrations of asbestos fibers to exceed a time weighted average, over eight hours, of two fibers, longer than 5 millimeters per cubic centimeter of air. It cited operations likely to cause these levels to be "the fabrication, installation, repair or removal (rip-out) of asbestos containing pipe and boiler insulation materials, power sawing of asbestos containing fire retardant materials, handling asbestos cloth curtains used for protection against weld splatter and in brake relining and repair work." No mention is made of asbestos containing gaskets or packing. Respirators were required for personnel working in concentrations of airborne asbestos fibers in excess of the stated level only. Caution labels were required for containers of asbestos raw materials, mixtures, scrap, waste and debris **except "where asbestos fibers have been modified by a bonding agent, coating, binder or other material** so that during any foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers occur in excess of the permissible exposure concentration. **"**

The July 1978 change number 3 to the Naval Sea System Command Technical Manual Chapter 635 titled "Thermal Insulation" imposed very strict requirements for the rip-out of asbestos insulation materials aboard Navy ships, restricting asbestos insulation removal to specially trained shipyard and Navy tender personnel who were part of an asbestos medical surveillance program. Change 3 required protective respirators, clothing and exacting removal procedures for these personnel. Areas where asbestos insulation was being ripped out were isolated and personnel not qualified in asbestos removal were not allowed in these areas. This instruction was issued just after Mr. Ankiel was released from active duty in April 1978.

The March 1979 change number 6 to the Naval Sea System Command Technical Manual Chapter 635 titled "Thermal Insulation" discusses "Control Measures for Gasket Cutting Operations". This section requires hand punching and shaping of gaskets, **when done in quantity,** to be done in designated asbestos work areas. This section also states "Neither respiratory protection nor protective clothing are required provided a HEPA equipped vacuum unit, approved for asbestos work, is used periodically during the operation to remove visible dust and small particles of gasket residue. This section further states gasket "hand punching and shaping may be performed **at incidental work sites to meet a specific limited need."** This instruction indicates shipboard fabrication of asbestos gaskets was still allowed about ten months after Mr. Ankiel left Navy service.

Asbestos packing and gaskets continued to be utilized in the Navy and on machinery manufactured for the Navy until at least 1990 as indicated by the following documents:

a. Newport News Shipbuilding and Drydock Company wrote a letter to the Aurora Pump Company dated 13 August 1985 which stated that compressed asbestos sheet gaskets (Federal Standard HH-P-46) and Teflon impregnated asbestos packing were **required** for use in the reactor plant fresh water pumps on USS Los Angeles (SSN 688) Class Submarines.
b. A Naval Sea Systems Command letter dated 27 April 1987 records Teflon impregnated asbestos packing was **still required** for applications where the temperature of the pumped fluid exceeded 182 degrees Fahrenheit. This letter approved an interim substitute for applications with lower temperatures.
c. Warren drawing revisions document Warren began to replace asbestos packing and gaskets in their products sometime after February 1990. Revision D to Warren drawing number R-395 was issued on 2 March 1989. This revision documented Warren still utilized one compressed asbestos sheet casing gasket and two rings of braided asbestos packing in a pump on that date. Revision B to Warren drawing 398-A was issued on 23 February 1990. This revision left three asbestos sheet gaskets (Navy symbol 2150) in place but revised the applicable specification from MIL-A-17472 to HH-P-46. This revision also left two rings of braided asbestos packing (Anchor # 317) in place but revised the applicable specification from MIL-P-577 to HH-P-34. Specifications beginning with HH are Federal Specifications while specifications beginning with MIL are Military specifications. Revision F to Warren drawing R-797 was issued on 11 July 1997. This revision replaced a compressed asbestos sheet pump casing gasket (MIL-A-17472) with a non-asbestos synthetic fiber sheet gasket and also replaced braided asbestos packing (Anchor #317) with non-asbestos aramid fiber packing.

As discussed earlier, I served at Charleston Naval Shipyard (CNSY) between July 1975 and August 1979. The Navy ceased the use of asbestos insulation both for new construction and for replacement insulation during repairs or overhauls in October 1975. As discussed in an earlier paragraph in this section of my report, the Navy policy was not to rip-out asbestos insulation "for the sole purpose of eliminating asbestos". I attended weekly status meetings held by Senior Naval Officers discussing work on every ship and submarine being overhauled or repaired at CNSY. Overhauls or extended availabilities were conducted on at least eleven SSNs and twenty seven surface ships at CNSY during my service there. None of these submarines or ships received asbestos insulation rip-outs unless these rip-outs were required as the result of specific repair work. Non asbestos insulation was utilized to replace any insulation that required removal after October 1975.

On 21 January 2014 I surveyed the machinery and equipment installed in main machinery room number one (MMR#1) onboard USS DULUTH (LPD 6). DULUTH was at the ESCO Marine Salvage Yard in Brownsville, Texas in the early stages of being dismantled. ESCO was in the process of removing a very large quantity of asbestos insulation in restricted areas using workers in protective gear during my visit. I did not visit these specific areas but saw insulation workers in protective gear with respirators entering these machinery areas. One storage area of the ESCO facility was devoted to collecting large bags of material clearly labeled as asbestos. Entry to this chain-link fenced area was restricted. It should be

noted DULUTH was decommissioned in 2005, thirty years after the Navy began the use of non-asbestos insulation on new ships and for insulation replaced due to repairs on older ship. The 1975 Navy policy did not require the removal of asbestos insulation unless this was necessary for machinery or piping repairs.

My observations at CNSY and on DULUTH have led me to the conclusion that the asbestos insulation installed on Navy ships and submarines during construction before October 1975 was, in many cases, never removed during the operational life of these vessels. Repairs to any damaged lagging covering this insulation were easily made with non-asbestos lagging without removing the insulation itself.

United States Government and Navy Documents Addressing Safety and Health Hazards

Based upon my years of experience supervising the preparation of Navy system and equipment technical manuals, hundreds of review sessions with Navy officials and employees concerning specifications, drawings and manuals and my extensive review of Navy specifications and standards, I can attest to the instructions the Navy required its equipment manufacturers to provide to warn of hazards associated with equipment delivered to the Navy. The Navy relied heavily upon its equipment manufacturers to identify hazards associated with their products. The hazards associated with exposure to asbestos and asbestos containing materials and equipment were not exempt.

The Bureau of Engineering, Navy Department, issued General Specifications for Machinery, Subsection S1-1, PLANS, on 1 December 1936. Section S1-1-h of this specification required manufacturers to provide installation, operating and maintenance instructions as well as “safety precautions” as an essential part of Instruction Books for machinery and electrical equipment. This document was reissued on 1 March 1941 with the same requirements.

The authority of the General Specifications for Machinery in terms of establishing requirements for machinery and equipment manufacturers is quite clear. Section A1, General Requirements, dated 1 February 1941 states: “These General Specifications for Machinery have been prepared by the Bureau of Ships, Navy Department for private shipyards and Navy yards building vessels for the United States Navy and inspectors, contractors, manufacturers, and others interested in the supply of machinery for the vessels of the United States Navy. They are the basis of all special specifications, form part of all machinery contracts, and the practice set forth therein shall govern in all cases unless modified or excepted by the special specifications issued in each individual case.

Military Specification MIL-B-15071 (SHIPS) dated 1 April 1950 is the first of the series of military specifications that replaced the General Specifications for Machinery, Subsection S1-1, PLANS and other Navy specifications, to govern the preparation of mechanical and electrical equipment instruction books. Section 3.3.1.1 specifically requires a safety notice for “special hazards” involved with the product. Section 3.3.1.8.1 (f) requires instructions to maintain safety devices to prevent damage to equipment or injury to personnel. New pages are required by section 3.3.6 for changes to the instruction book. This requirement provides the mechanism to add hazard warnings to the manual if hazards are detected after the manual has been shipped. Section 3.3.7 states that instruction books are to be delivered with the first unit of equipment shipped. The next edition of the Military Specification

for equipment instruction books, MIL-B-15071A (SHIPS) dated 20 October 1952, contained essentially the same safety requirements as MIL-B-15071 (SHIPS).

Military Specification MIL-T-15071B (SHIPS) was issued on 16 August 1954. This Specification addresses requirements for technical manuals for mechanical and electrical equipment. It invokes the same requirement for safety notices for hazards in sections 3.5.1.1 and 3.6.1.1 as were invoked in the two previous editions. Section 3.5.1.8.1 also contains the same requirement to provide instructions to maintain safety devices. Section 3.2 not only requires shipping two copies with each unit of equipment but also provides for distribution throughout the Navy. The requirement for new pages for changes remains intact. Section 3.6.1.3 adds the requirement for "precautions" to be identified during installation of equipment.

MIL-M-15071C (SHIPS) which was issued on 10 September 1957, states in Section 1.1 that the requirements in this specification are the minimum acceptable requirements. Sections 3.3.3.2 and 3.4.3.2 provide for the use of "emphatics" in capital letters to be provided adjunct to the text to highlight notes, cautions and warnings. "WARNINGS" are clearly required for "operating procedures, practices etc. which will result in personnel injury or loss of life if not correctly followed." Section3.3.1.2.5 requires safety precautions as a part of operating instructions and section 3.3.1.2.6 requires safety precautions for installation instructions. Language for maintenance of safety devices and the requirement for new pages for new information are retained from prior editions.

MIL-M-15071D (SHIPS), which is the fourth revision of this specification, is dated 6 June 1961. This specification states in section 1.1 that "The intent is to accept the manufacturer's commercial type of manual or one prepared in accordance with his commercial practice whenever it is roughly equivalent to the detail requirements included herein." This statement clearly indicates that the United States Government intention at this time was to accept commercial practices which are governed by state law. Section 3.3.6 provides for the use of "emphatics" in capital letters to be provided immediately preceding the text to highlight notes, cautions and warnings. "WARNINGS" are clearly required for: "operating procedures, practices etc. which will result in personal injury or loss of life if not correctly followed". Section 3.1.7 requires instructions for precautions during equipment installation, section 3.1.9 requires safety precautions for operating instructions and section 3.1.10.1 requires that instructions stress the importance of properly maintaining safety devices to prevent damage to equipment or injury to personnel. Section 3.5 maintains the requirement for new pages for new information. Section 3.7 maintains the requirement to ship two copies with each unit of equipment and to ship two additional copies to the Navy for each ship on which the equipment is installed.

The 15 April 1962 edition of this specification, MIL-M-15071E (SHIPS), maintains the requirements of the previous editions and adds the requirement in section 3.3.3 for installation instructions to include precautions during equipment unpacking and handling as well as safety precautions during installation. Section 3.5.3.2 also adds the requirement for repair instructions to include any "cautions or warnings which must be observed to protect personnel and equipment." MIL-M-15071F (SHIPS) issued on 28 August 1967, contains essentially the same safety requirements.

MIL-M-15071G (NAVY), dated 1 August 1969 maintains previous requirements and adds requirements in section 3.5.6.4 to include safety precautions when scheduling equipment performance testing. Section 3.5.6.5 requires that safety be a specific element of planning equipment overhauls. Section 3.6.1 details the specific requirements for system manuals and requires that an entire chapter be devoted to safety precautions. Section 3.6.3.4.3 requires that the specific hazardous components in each system be identified and described and that handling precautions for these components be described as well. Section 3.6.5.2, Operating Modes, requires: "Emphasis shall be placed by the use of warnings on the safe operation of controls, which if operated improperly, could result in hazards to personnel or damage to equipment." MIL-M-15071H (NAVY) which was issued on 17 July 1972 contains all of the safety, warning and handling requirements of MIL-M-15071G as well as those of previous editions.

MIL-M-38784A dated 1 January 1975 was a Military Specification for technical manuals. Section 3.3.9.1 addresses health hazards. It states that procedures shall be consistent with the safety standards established by the Occupational Safety and Health Act (OSHA), Public Law 91-596 and Executive Order 11612. It also states "Warning and cautions shall also be used when hazardous chemicals or adverse health factors in the environment or use of the equipment cannot be eliminated." This document instructs "a list of personnel protective devices shall be included." The 16 April 1983 edition of this Military Specification, MIL-M-38784B, contains these same requirements.

The Navy Shipment Marking Handbook, issued in 1942, governed shipping requirements for material provided to the Navy during construction of PUTNAM. Paragraph 7 of this document states: "Any necessary instructions for assembling of material or warning as to handling, storage, and operation shall be packed with such material." Paragraph 8(a)(14) of this Handbook states: "The following markings shall appear on the outside face of each package in accordance with accompanying illustrations……special markings such as top, glass, acid, explosives, keep dry, handle with care, fragile, delicate instruments, and other such markings as may be required by the Interstate Commerce Commission or other regulations." Paragraph 10(e) of the Navy Shipment Marking Handbook states: "*Special assembly instructions or warnings*. – When such instructions are necessary, shipping activities shall see that they accompany the shipment and that they are conspicuously indicated." Taken together these three statements from the Navy Shipment Marking Handbook demonstrate that the U.S. Navy fully expected manufacturers and other providers of material to the Navy to identify hazards associated with their products, to conspicuously provide warnings for these hazards and to fully comply with the regulations of other authorities concerning warnings.

Some manufacturers have alleged the United States government would not allow Navy equipment manufacturers to place warnings concerning the hazards of asbestos on their products or in their drawings and technical manuals. The United States government replied to interrogatories in the case of GAF Corporation v. the United States of America in the United States Claim Court, Civil No. 287-83-C. In interrogatory numbers 103 and 126 GAF alleges MIL-STD-129 "prescribed the exclusive manner of marking containers for shipment and storage" and therefore did not permit the placement of a marking or label concerning hazards regarding exposure to asbestos dust. The government response to these interrogatories cites the "Deviations" and "Unauthorized Markings" paragraphs of the "General Requirements" of MIL-STD-129. This response states "These paragraphs allowed for deviations from the

standard, if necessary, with instructions from the cognizant activity and for markings other than those specified in the standard, if authorized by the cognizant activity or *required by regulation or statute."*

As discussed below, at least one manufacturer provided warnings in an instruction book for equipment and personnel safety related to the use of solvents in the maintenance of machinery. These solvents were not provided by this manufacturer but were recommended for cleaning or repairing its equipment. This example illustrates the Navy, who approved machinery instruction books, did not preclude warnings protecting the health of sailors and shipyard workers. I have never reviewed any Navy or United States government documentation forbidding warnings concerning hazards associated with handling asbestos or breathing asbestos dust even though asbestos gaskets, packing and, in some cases, insulation was actually a part of manufacturers' machinery.

In the instruction book for turbine generator sets on DD 692 Class Destroyers, General Electric recommended the use of three types of grease solvents for cleaning electrical windings. This instruction book warns gasoline and benzene are inflammable and their vapors can be explosive, and "there should be good ventilation" and "every care taken to avoid fire risk". It warns "care should be taken" to avoid saturating clothing with these solvents and any saturated clothing should be removed before the worker leaves the job." The GE instruction book warns "adequate ventilation must be present if carbon tetrachloride is used." This GE instruction book was approved by the Navy.

United States and State government sources state long term inhalation exposure to carbon tetrachloride causes liver and kidney damage and may cause cancer. These sources state exposure to benzene may cause seizures, paralysis or affect normal heart rhythms and exposure to gasoline fumes may result in memory loss or impaired muscle function.

Summary

HOLLISTER was built in 1945 and 1946 and Mr. Ankiel served on HOLLISTER between 1975 and 1978. During the 1940s through October 1975, asbestos containing materials were the most commonly utilized materials for insulation, gaskets and packing for pumps, valves, turbines and other machinery and components. This was the case for both the U. S. Navy as well as commercial marine and shore-based applications at this time. Accessible machinery and equipment utilized in hot systems onboard these ships was insulated for thermal efficiency of the propulsion plant, to prevent burns to sailors and to reduce the temperatures in machinery spaces to habitable levels. The systems in which this machinery was located could not operate satisfactorily as intended by Navy specifications and the ships could not meet mission requirements if the machinery in these systems was not insulated. Navy sea water pump specifications required the use of compressed asbestos sheet gaskets to seal pump casings. Compressed asbestos sheet gaskets were also commonly used for internal gaskets in valves and pumps. This material, along with spiral wound metallic-asbestos gaskets, was also the predominant material used for gaskets in the flanged joints connecting pumps and valves to piping systems and sections of pipe to each other. The most commonly used materials for packing to seal valve stems and pump shafts also contained asbestos fibers.

The Navy began to use non-asbestos materials for insulation on new ships and to replace asbestos insulation removed for repairs on older ships in October 1975. In 1978 the Navy adopted strict practices that restricted all personnel, except insulators, from spaces where asbestos insulation was being removed.

In about 1978, just as Mr. Ankiel was completing his Navy service, the Navy began the process of working with industry to develop non-asbestos substitutes for asbestos gaskets and packing. This process continued at least until the mid-1980s based upon testimony from individuals designated as most knowledgeable concerning their companies usage of asbestos. At least one machinery manufacturer continued to utilize asbestos gaskets and packing in its products until 1990.

Gaskets and packing were wear items that were regularly replaced during service. If an asbestos-containing part was an original component of an item of machinery or a valve it was replaced with the same type of part, as called out in the drawings and instruction books prepared by the manufacturer. As illustrated extensively in this report, original equipment manufacturers often sold replacement parts, including packing and gaskets, directly to individual ships and to shipyards, as well as to Navy Supply Centers and SPCC for use as onboard spares on Navy ships and submarines. Based on these factors, it is highly likely the valves, pumps and other machinery contained asbestos packing and gaskets while Mr. Ankiel served aboard HOLLISTER. Many asbestos replacement gaskets and packing were provided by original equipment manufacturers long after construction of the ships on which this equipment was installed.

Engineers employed by the manufacturers of machinery and equipment for the U.S. Navy designed this machinery and equipment. This is well documented by manufacturers' product drawings and by their instruction books and technical manuals. The Navy Bureau of Ships did publish specifications for this machinery and equipment but these documents did not tell manufacturers how to design products. These specifications did provide allowable materials for use in Navy products but these specifications provided for a range of choices in most cases. Specifically with regard to gaskets and packing, most of these specifications allowed a range of materials that included both asbestos-containing and non-asbestos materials for most services and most temperature and pressure ranges. Only products exposed to superheated steam and gases of combustion were mandated to contain asbestos packing. Manufacturers of sealing materials and machinery have documented the difficulty workers would have encountered had they attempted to substitute non-asbestos gaskets and packing for the asbestos choices made by manufacturers during the design of their machinery.

To summarize, Mr. William Ankiel served over twenty nine months in the forward fire room aboard USS HOLLISTER (DD 788). He and other sailors were exposed to airborne asbestos fibers without the mitigating effects of personal protective equipment or clean work practices. Equipment manufacturers during his service were clearly required by U.S. Navy specifications to utilize warnings and cautions when hazardous chemicals or adverse health factors in the environment or use of the equipment could not be eliminated and to include a list of personnel protective devices in their manuals. As discussed in more detail in a prior paragraph, the United States Government has stated warnings concerning asbestos hazards were permitted. Equipment manufacturers during the time period of his service were

clearly required by U.S. Navy specifications to include safety precautions and the use of safety devices in their equipment instruction books. Manufacturers were required to ship copies of their instruction books with their equipment and to provide additional copies for each ship on which the equipment was installed. Further, equipment manufacturers were required to prepare new pages for equipment manuals when new information about their equipment became known. This provided manufacturers with an opportunity to provide warnings about hazards concerning their equipment even if this information became known after instruction books were prepared and equipment was shipped. Beginning in 1957, warnings were clearly required for operating procedures and practices which would result in personnel injury or loss of life if not correctly followed. In 1975, when Mr. Ankiel began his service onboard HOLLISTER, the Navy required warnings and cautions when hazardous chemicals or adverse health factors in the environment or use of the equipment could not be eliminated. These manufacturers were also required by the U.S. Navy to warn of hazards in material being shipped and to comply with the warning requirements of other authorities. Clear documentation has been cited in this report that identifies those manufacturers that provided machinery and equipment to HOLLISTER.

Arnold P. Moore

Arnold P. Moore, PE

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Education and Qualifications

- MS, Naval Architecture and Marine Engineering, Massachusetts Institute of Technology
- Professional Degree of Ocean Engineer, MIT
- BS, Naval Science, United States Naval Academy
- Registered Professional Engineer
- Life Fellow, Society of Naval Architects and Marine Engineers (SNAME)
- Winner of SNAME William M. Kennedy Award for Shipbuilding Systems

Summary of Experience

Consultant, Naval Architecture and Marine Engineering

February 2007 to Present

Working as a marine engineering expert with client law firms in the field of asbestos litigation. As detailed below I bring extensive U.S. Navy experience as an engineering duty officer in the operation, overhaul and maintenance of steam propulsion plants of WW II vintage and later. I bring over 30 years of experience as a licensed Professional Engineer and engineering executive responsible for the design of a number of classes of U.S. Navy and Coast Guard ships as well as international warships. I have completed many hours of research and compiled documentation on asbestos usage and safety requirements on U.S. Navy ships.

Northrop Grumman Ship Systems

August 1982 to January 2007

Sector Vice President, Engineering: October 1992 to January 2007

Technical and administrative leadership of over 2000 personnel in the disciplines of naval architecture, marine mechanical, electrical, electronic and structural design engineering. Responsible for all aspects of naval ship design, logistics analyses and technical publications for both new classes of ships as well as for modernization of U.S. Navy and Coast Guard ships in fleet service.

Arnold P. Moore, PE: Northrop Grumman Experience continued

Director Design Engineering: May 1985 to October 1992

Responsible for a group of over 1000 personnel engaged in design engineering and preparation of technical publications for new classes of U.S. and international naval and coast guard ships.

Chief Naval Architect: August 1982 to May 1985

Leadership of over 300 naval architects, structural engineers and designers in the design of new classes of warships.

Major Classes of Naval and Coast Guard Ships Designed

- Ticonderoga Class Aegis Cruisers – CG 47 and CG 52 Baselines
- Wasp Class Amphibious Assault Ships – LHD 1, LHD 5 and LHD 8 Baselines
- San Antonio Class Amphibious Assault Ships- LPD 17 Baseline
- Arleigh Burke Class Guided Missile Destroyers – DDG 79 Aviation Baseline
- U.S. Coast Guard Berthoff Class National Security Cutter - NSC 1 Baseline
- Israeli Navy Corvettes – SA'AR 5 Baseline
- Fleet Modernization for Spruance Class Destroyers - DD 963 Baseline
- Reactivation design for Battleships Iowa and Wisconsin
- Modernization Design for Venezuelan Navy Frigates – Lupo Baseline

M. Rosenblatt and Son, Inc., Naval Architects and Marine Engineers

August 1979 to August 1982

Technical Director (18 months) and **Chief Naval Architect** (18 months), Charleston, SC Branch. Responsible for technical direction of 60 personnel and management of fleet modernization design for destroyers, tenders and fleet minesweepers. Also responsible for oversight of technical publications.

Commissioned Service United States Navy

June 1968 to August 1979

Engineering Duty Officer: June 1975 to August 1979

Served first two years at Charleston Naval Shipyard as Docking Officer, Diving Officer and Ship Production Superintendent. Responsible for coordination of ship overhauls and for the safe drydocking and underwater hull work on U.S. Navy ships. Ships overhauled included destroyers and tenders with steam propulsion plants and nuclear powered submarines. Served second two year period as the submarine overhaul program manager, responsible for overhaul planning, financial management, work authorization and customer interface.

Arnold P. Moore, PE: United States Navy Experience, continued

Navy Graduate Student, Massachusetts Institute of Technology: May 1972 to June 1975. Navy sponsored student in three year graduate level **Ship Design and Construction** curriculum. This program stressed naval architecture, marine engineering and structural engineering with supplemental courses in electrical engineering. A number of courses were focused upon steam propulsion and shipboard machinery and included courses in thermodynamics, fluid dynamics, heat transfer, and materials science as well as boiler, turbine and pump design.

Damage Control Officer, USS Newport News CA 148: March 1970 to April 1972
Directed a department of over 200 engineering officers, petty officers, and fireman responsible for recovery from battle damage, flooding, fire and collision. Also responsible for all shipboard repair efforts and auxiliary machinery and systems. Qualified as engineering officer of the watch and stood watch as senior officer responsible for proper operation and maintenance of the steam propulsion plant while the ship was underway. The Newport News was designed during WW II but she was completed and commissioned after the war. Her propulsion plant and machinery were typical for WW II era surface combatants.

Damage Control Assistant, USS Brumby DE 1044: July 1968 to March 1970
Led a division of 30 petty officers and fireman responsible for damage control, firefighting, auxiliary machinery, ship repair and electrical systems. The Brumby had a pressure fired steam propulsion plant.

United States Naval Reserve

September 1979 to August 1994

Engineering Duty Officer: Completed 15 years service in the U.S. Naval Reserve concurrently with my civilian career. This service included two days of active service each month and two weeks of continuous service each year. This service was spent at Naval Shipyards, Supervisor of Shipbuilding Offices at private shipyards and the Naval Sea Systems Command working on naval ship engineering projects on a wide variety of ship classes. Retired as a **Captain (06).**

2024 Fee Schedule

$440.00 per hour for all work performed including travel

Frost Law Firm: Ankiel Case Reliance Documents **1 of 2**

Note: This reliance listing includes documents not provided by Frost specifically for this case. All documents are on a single CD.

United States Government and Ship Records

- 1984-08-10-GAF v. United States-RFAs

- QPL Guide

- Bureau of Ships letter dated 10 August 1943 (BSLtr10Aug43)

- Supervisor of Shipbuilding, USN, New York, NY letter dated 13 October 1943 (SSNY13Oct43)

- USS HOLLISTER (DD 788) Ship Records

-2001 NAVSEA Ship Availability Database

Company Records

-Gasket & Packing Substitution: JCraneLtr1Nov78, CraneCo9Mar81, BufPmp21Nov86, GE13Feb90, A&M TB08-10

-Buffalo Pumps: BufCombIB-Pkg&Gask

-Crane Company Valves: AsbCautionTag-Crane; HFarleyDepo-CautionTag, Cranite Catalog, Crane 17232, 17233, 20727, 21141, 21271, 21342, 22012, 22128, 22139, 22152, 22172, 22173, 22174, 22175, 22234, 22235, 22300, 22301, 22388, 22389, 22391, 22405, 22414, 22419, 22423, 22469, Crane Dwg. Nos. A-36239C and A-36241

-Crane Company Sales Documents: Crane Company Master Parts Book, CraneGaskSaletoNavy, 1963-1967 Crane Pkg PHNSY, 1965-11-19 Crane shop order, 1966-09-22 Crane shop order, 1967-11-01 Crane shop order, 1970-05-21 Crane quotes, 1970-06-19 Crane shipping, 1970-07-10 PHNSY PO to Crane, 1972-07-20 Crane shop order, 1973-05-22 Crane quote (includes material list), 1976-04-05 Crane shop order, Crane Material List A-36166

-DeLaval Oil Pumps: DeLaval G-10201, DeLaval G-10207, DeLaval G-10214, DeL Pmp Turb LO Cool

-DeLaval Feed Pumps: DeLaval G-10228, DeLaval G-10241, DeLaval G-10083, DeLaval G-10089, DeLaval G-10188, DeLaval-MFPIB, DeLaval-MFBPIB, DeLaval-AFBPIB

-DeLaval Main & Auxiliary Condensate Pumps: DeLaval Assy-G10068, DeLaval Assy-G10194

-Elliott Deaerating Feed Tanks: ElliottIB-DD692, Elliott NH-30066

-Foster Wheeler Boilers: FWDD692InstBk, FW-BoilerBM-DD692cl, FW-NY-420-907 (3 files), FWHighTempInslBlock, FW NY-420-934-3 Furnace Brickwork (Tile), FWSalesDocs1&2

-Gardner Denver Fire Pumps: GarDenFirePmpDwgs

-General Electric Main Propulsion Turbines: GEGaskMnTurb-DD692, GEInslMnTurb-DD692

-General Electric Generators: GEList3736812, WW8452395, WW8453315, WW8453351, WW8453352

-Griscom Russell: GRNYE-1933, GRNYE-1934, G-RDistPlantIB

-John Crane Packing: JohnCraneHoudaillePkg-Excerpt, JCraneSS#1, JCrane2150Catalogs, JCrane2150NavyAppr

-Northern Hand Driven Fuel Oil Service Pump: North4500-15-F665

-Sturtevant Auxiliary Turbine: BFS-MFBP- D15-632-O

-Warren Fire & Bilge Pumps: War BS-1195, War BS-1196

-Warren Emergency Feed Pumps: WarBS5-1705, WarBS5-1706

-Warren Main Circulating Pumps: War BS5-1417

-Warren Fresh Water Pumps: War BS4-1624-FW

-Warren Salt Water Circulating Pump: War BS5-1524-Dsl

-Warren Sales Documents: NavySalesDoc-War, WarrenSalestoPHNSY

-Westinghouse Forced Draft Blowers: WH-FDB-DD692&445

-Westinghouse Main Circulating Pump Turbine: WH 25-J-91

Destroyer Insulation and Lagging Drawings (all on CD)

DD692-S3902-1&13 Boilers (DD692InslBoiler1&13)

DD692-S3902-2: Fuel Oil Heaters (DD692InslFoHtr2)

DD692-S3902-3: Distilling Plants (DD692InslDist3)

DD692-S3902-4: Main Feed Pumps (DD692InslFdPmp4)

DD 692-S3902-6 & 7: Valves and Flanges (DD692InslVlv&Flange6&7)

DD 692-S3902-9: High Pressure Turbine (DD692InslHPT9)

DD692-S3902-10: Low Pressure Turbine (DD692InslLPT10)

DD692-S3902-11: Turbine Driven Generators (DD692InslSSTG11)

DD692-S3902-12: Miscellaneous Pumps (DD692InslMiscPmps12)

DD692-S3902-14: Main Circulating Pumps & HP Air Compressor (DD692InslMnCirc14)

DD692-S3902-15: Deaerating Feed Water Tanks (DD692DFT15)

DD692-S3902-16: Forced Draft Blower Turbines (DD692InslFDB16)

Gasket and Packing Specifications and QPLs

Navy Specifications: 33P13, 33P25, 33P26, 33G5, BS-153Alt6, MIL-P-17303PkgSpec&QPL, AsbShtGaskQPLs

Documents Addressing Gasket and Packing Usage and Controls

SEC6100Memo-9Dec68

OpNav1974-ContAsbExp

NavSea1975-AsbElim,Sub,Protec

NNSB13Aug85-AsbGas&Pkg-SSN688

NSSC27Apr87-AsbPkgInUse

Warren Drawing Revisions: War R-395-RevD, War R-398A-RevB, War R-797-RevG

Documents Addressing Duty to Warn

General Specifications for Machinery, Subsection S1-1, Plans, 1 Dec 1936 (S1-1Plans1936)

General Specifications for Machinery, Subsection S1-1, Plans, 1 March 1941 (S1-1Plans1941)

General Specifications for Machinery, Section A1, General Requirements, 1 February 1941 (41GenSpecMchryA1)

MIL-B-15071 (SHIPS) 1 April 1950 (MIL-B-15071)

MIL-B-15071A (SHIPS) 20 Oct 1952 (MIL-B-15071Aexc)

MIL-T-15071B (SHIPS) 16 Aug 1954 (MIL-T-15071Bexc)

MIL-M-15071C (SHIPS) 10 Sep 1957 (MIL-M-15071Cexc)

MIL-M-15071D (SHIPS) 6 June 1961 (MIL-M-15071Dexc)

MIL-M-15071E (SHIPS) 15 April 1962 (MIL-M-15071Eexc)

MIL-M-15071F (SHIPS) 28 April 1967 (MIL-M-15071Fexc)

MIL-M-15071G (SHIPS) 1 August 1969 (MIL-M-15071G)

MIL-M-15071H (SHIPS) 17 July 1972 (MIL-M-15071H)

1975-01-01 MIL-M-38784A

1983-04-16 MIL-M-38784B

Navy Shipment Marking Handbook, 1942 (NavyShipMarkHBExc)

Solvents: GEIB-SSTG-DD692

Arnold P. Moore, PE: Listing of Depositions and Trials (Four Years prior 6/01/2020) **(1 of 2)**

Frederick Lee Toney III v. Atwood and Morrill Co, et al. United States District Court, Southern District of New York, No. 1:15-CV-07413. Deposition 6/15/2016

Henry C. Snyder and Lynn Snyder v. Air & Liquid Systems, Corp., et al. United States District Court, Southern District of New York, No. 1:15-CV-8738-LAK. Deposition 8/15/2016

Garland Dale Pepper v. ABB, Inc., et al. District Court of Harris County, Texas, 11th Judicial District, No. 2014-02782. Deposition 12/21/2016

Leon Holman v. Armstrong Int., Inc. et al. Superior Court, New Castle County Delaware, CA No. N14C-02-152 ASB. Deposition 1/27/2017

Becky Davis, et al. v. Air and Liquid Systems Corp. et al, United States District Court, District of Arizona, Case No. 4:14-cv-2288-RCC-LCK. Deposition 2/22/2017

Walter R. Messel, et al. v. A. W. Chesterson Company, et al., United States District Court for the Northern District of Illinois, Eastern Division, Case No. 1;15-CV-11344. Deposition 7/19/2017

Marion Dean Jordan, Jr., v. Armstrong International, Inc., et al., District Court, Harris County, Texas, 11th Judicial District, No. 2016-15523-ASB. Deposition 9/20/2017

Willie and Flora Everett v. Air and Liquid Systems Corp., et al., United States District Court Eastern District of Missouri, Eastern Division, No. 4;17-cv-00230-HEA. Deposition 10/18/2017

Patricia Jacobs v. Air and Liquid Systems Corp., et al. St. Louis Circuit Court, Twenty-second Judicial District, Missouri, No:1622-CC11534. Deposition 11/29/2017

Michael B. Donohue and Ann Donohue v CBS Corp. et al. United States District Court, Southern District New York, No. 17-CV-7232-WHP. Deposition 3/2/2018

William Boesenhofer and Diane Boesenhofer v. AECOM et al. Court of Common Pleas, Philadelphia County, Pennsylvania, No. 3513. Deposition 3/21/2018

Jaime DeGuzman, et al. v. Crane Co., et al. United States District Court, Northern District of California, No. 17-cv-02228-PJH. Deposition 11/7/2018

Thurman Lee Hester and spouse, Lindya Hester, v. Alfa Laval, Inc. et al. in the District Court for Oklahoma County, Oklahoma. No CJ-2015-5853. Deposition 1/04/2019

Icom Henry Evans and Johanna Elaine Evans v. Alfa Laval, Inc. et al. in the United States District Court for Delaware, No. 1:15-cv-00681-SLR-SRF. Deposition 4/26/2019

Arnold P. Moore, PE: Listing of Depositions and Trials continued **(2 of 2)**

Donald Arthur Yaw and Marietta Dianne Yaw v. Air and Liquid systems Corp., et al. in United States District Court for Western District of Washington at Tacoma, No. 3:18-cv-05405-BHS. Deposition 5/1/2019

Brennan James Atkeson and Khaliliah Smith Atkeson v. Union Carbide Corp. et al. in the District Court of Pontotok County, Oklahoma, No. CJ-2016-57. Trial 5/9/2019

Sherri L. Deem v. Air and Liquid systems Corp., et al. in United States District Court for Western District of Washington at Tacoma, No. 3:17-cv-05965-BHS. Deposition 6/21/2019

James T. McAllister, Jr. v. McDermott, Inc., et al. in 19th Judicial District Court, East Baton Rouge Parrish, Louisiana, No. C665093. Deposition 10/21/2019

Thomas and Constance Gaskill v. Air and Liquid Systems Corp., et al. in United States District Court for New Jersey, No. 2:17-CV-10757-ES-SCM. Deposition 11/6/2019

James Effinger, et al., v. Air and Liquid Systems Corp., et al. in United States District Court Middle District of North Carolina, No. 1:15-CV-00448. Deposition 11/15/2019

Linda Hammell v. Air and Liquid Systems Corp. et al. in in United States District Court for New Jersey, No. 3:14-CV-00013-MAS-TJB. Deposition 11/22/2019

Carol Gilbert-Arozian v, Aurora Pump Company, et al. in United States District Court for Delaware, No. 1:19-cv-00011-MN-SRF. Deposition 12/5/2019

Amanda Brook Hailey (est of Charles Anthony Shockley) v. Air and Liquid Systems Corp. et al. in United States District Court for Maryland, No. 1-18-CV-02590-DKC. Deposition 1/10/2020

Peter Barajas, Jr. v. Air and Liquid Systems Corp. et al. California Superior Court, Los Angeles County, No. 19STCV201117. Deposition 2/26/2020

Rose Dianne Boesenhofer (widow William Boesenhofer, Sr.) v. AECOM et al. in the US District Court for the Eastern District of Pennsylvania, No. 2:17-cv-01072-ER. Deposition 5/8/2020

Ronald Greth and Lyn Greth v. Air and Liquid Systems Corp. et al. in Circuit Court, Seventeenth Judicial District, Broward county, Florida, No. 19-023152 CA27. Deposition 5/29/2020